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CONSTRUCTION OF A NEW FEDERALLY FINANCED RAIL SYSTEM IN MIAMI, FLA.

(98-47)

HEARING

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

OF THE

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

DECEMBER 13, 1983, AT MIAMI, FLA.

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CONSTRUCTION OF A NEW FEDERALLY FINANCED RAIL SYSTEM IN MIAMI, FLA.

TUESDAY, DECEMBER 13, 1983

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION,
Miami, Fla.

The subcommittee met, pursuant to call, at 10:30 a.m., in the chambers of the Dade County Commission, Miami, Fla., Hon. Elliott H. Levitas (chairman of the subcommittee) presiding.

Mr. LEVITAS. The Subcommittee on Investigations and Oversight of the House Committee on Public Works and Transportation is in Miami today for a hearing on the construction of a 20.5-mile rail transit system. The project in this community is one of seven rail projects under construction or nearing construction in major cities throughout the Nation. All of these projects will depend on funds appropriated by the Congress and distributed by the U.S. Department of Transportation.

The Committee on Public Works and Transportation is the authorizing committee for the Federal program, under which Federal capital and operating assistance is made available to more than 375 transit properties. The other essential committee in this process is the Appropriations Committee, and the Appropriations Subcommittee that is the most directly involved is the one headed by my good friend from Miami, your able Congressman, William Lehman.

We are pleased that Bill Lehman can be with us here today as well as Senator Claude Pepper. I might say that were it not for Bill Lehman's interest and proposals to this subcommittee, I can assure you that this particular matter would have a different priority. And so I want to express my appreciation to Bill for that.

We began this morning with a ride on Metrorail, covering, I guess, about 10 miles from Dadeland South to the Government Center. I must say it was an impressive ride, smooth, quiet, and the view as one sweeps along Biscayne Bay headed toward downtown Miami has to be one of the most eye-pleasing for any transit system in the country.

This city has reason to be proud, and we are happy to be here with you to share in that pride. Being from Atlanta, I am keenly aware of what a new rail system can contribute to a community. It is a tremendous community asset, and I understand some visionary things are being done here that will maximize that asset in the years to come. On that you are to be congratulated.

Having said all of this, let me add that I know that getting from where you were to where you are today has not been a simple task. The construction of any major public facility today is far more difficult than was the case in the not-too-distant past. Not only does Federal and State law call for far more participation in the decisionmaking process by all affected parties, which is as it should be, but expectations in safety, reliability and comfort are being raised all the time.

Meeting those higher expectations in the glow of public and media attention adds tremendously to the task. But that is the way it must be in a democratic society, and achievement under those circumstances is all the more rewarding.

We know there has been controversy in Miami. Some of the witnesses from whom we shall be hearing have expressed apprehensions about a Federal oversight hearing rekindling old misunderstandings and animosities. I would hope that all participants will view this hearing as a platform to share ideas and insights in an amicable manner.

It is true that we need to understand the turbulent history of the Metrorail project. But let me assure everyone with any concern that our purpose is to learn what lessons have been learned and to determine what, if any, application they may have for other communities, as well as for any future activity here.

We know that the Department of Transportation's Inspector General and the Dade County Organized Crime Bureau have had criminal investigations underway. We do not in any way wish to interfere with those investigations or any possible criminal actions which may flow from them. As we understand it, the role of the Inspector General of the DOT in examining construction practices has been minimal since he raised some questions about what had been observed during site visits several months ago. He has not been greatly involved. We therefore have not called as witnesses the investigators of the Department of Transportation or of the county investigative unit.

The construction projects of the Urban Mass Transportation Administration have not had the close Federal involvement of, say, Federal-aid highway construction financed by the Federal Highway Administration. The UMTA program is a different kind of program. That is not to say that construction management, and quality control, and quality assurance should be any less important than they are in other Federal construction.

Several U.S. cities that contemplate the building of new light and heavy rail systems undoubtedly can profit from the experience here in Miami. I know Mr. Lehman's committee, as well as our committee, will have great interest in any recommendations that these hearings may produce.

As I indicated earlier, it is at Mr. Lehman's invitation, in fact, that we are looking at this general area.

The Oversight Committee has its roots in oversight of the interstate highway program in the 1960's. Now we have broader responsibilities. In addition to the Federal-aid highway system, and public transportation, it is our responsibility to seek reasonably priced, quality construction in water projects, wastewater treatment

plants, airports, and Federal buildings. We intend to look at this matter in a multidimensional and comprehensive way.

That is why we are in Miami. There is a tremendous potential benefit for the taxpayers of this Nation. We begin our search here. It is with that objective in mind that we convene this oversight hearing.

Before turning to my colleague from New York, the ranking minority member of the subcommittee, Congressman Molinari, for any statement, I want to express my own appreciation to Major Steve Clark and the members of the Dade County Commission for permitting us to use these facilities today, and I want to say that the cooperation of all local officials with this committee and our staff has indeed been commendable.

With that, I would like to inquire whether my colleague, the ranking member, wishes to make an opening statement. Mr. Molinari.

Mr. MOLINARI. Thank you, Mr. Chairman. I do have an opening statement. Let me, before I do that, thank all of those who helped us view the problem firsthand this morning. It was a very interesting tour and I think we were able to get a perspective onsite that we could not get in these hearing chambers. I would like to observe that we are commencing the hearings a half hour later than scheduled. I am hopeful that that is not going to result in restricting or curtailing the testimony, because this represents a very important hearing for us, those of us that are on the Public Works and Transportation Committee's Subcommittee on Investigations and Oversight.

I wish to echo your welcome of our good friend and colleague, Mr. Lehman, whose interest in and support of the Dade County Metrorail project is well known to everyone.

Mr. Lehman's interest, together with larger concerns over the wise expenditure of Federal moneys under the jurisdiction of his Transportation Appropriations Subcommittee and our full Committee on Public Works and Transportation, is the predominant reason why we are here today.

I also welcome our other colleagues, Mr. Shaw from the State of Florida, Senator Pepper, our good friend. Good to see you here.

Welcome also to our other witnesses whose testimony today will assist the subcommittee in this inquiry and also make a valuable contribution to what we expect will be a more extensive inquiry into construction management and quality assurance and control procedures for all large-scale federally assisted construction programs under the committee's jurisdiction.

The chairman stated, and I wish to reinforce for the record, that the subcommittee's purpose in holding this hearing is not to reopen old wounds and controveries which, we understand, have been the object of intense media interest in the Miami area. Nevertheless, of necessity we will need to thoroughly go over some of the same old ground in order for this subcommittee to responsibly carry out its oversight function.

I expect that we will be directing some hard questions at the witnesses—not for the purpose of embarrassing any of the participants, but for the purpose of developing our own insight into the problems which occurred here and to determine whether those

problems are of the sort and magnitude which require changes in the way in which the Federal Government safeguards its, and ultimately the taxpayers', investments in major public facilities. That is the sole purpose of our inquiry.

As I see it, there are two chief objectives that we have here today: First, to find out what happened here—we have two virtually opposite accounts of what transpired, which certainly arouses curiosity as to somebody being very right and somebody being very wrong; and beyond that, the overriding question, from our perspective, as to the future role of UMTA in projects of this size.

With that, Mr. Chairman, I look forward to a productive and informative day. Thank you very much.

Mr. LEVITAS. Thank you, Mr. Molinari.

I would like now to introduce the other members of the subcommittee who are on the panel today. To my right, Congressman Roy Rowland of Georgia and Congressman Henry Nowak of New York, and as you have already noted, to the left is a member of our full committee, Congressman Clay Shaw from Fort Lauderdale. We are very pleased to have you with us today.

Before recognizing Bill Lehman for an introductory presentation and statement, I have already noted the presence of our good friend Claude Pepper, a person who has been for many years one of the people who I have looked up to in the Congress and who is now chairman of our Rules Committee. Aside from the important things that Claude Pepper does for the Nation, which is well known, I can tell you from my own vantage point that he is one of the most persistent advocates for the interests of south Florida and Dade County that I have ever seen, and he has not forgotten the home folks when he is dealing with those great interests in Washington.

Mr. LEVITAS. Congressman Pepper, if you have a statement to make at this time, please proceed.

STATEMENT OF HON. CLAUDE PEPPER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF FLORIDA

Mr. PEPPER. Thank you very much, Mr. Chairman. I am very grateful to you and your colleagues, our colleagues of the House, for being here today, and certainly for your very kind words of introduction. Mr. Chairman, before you end this visit, I insist that you go up the street to the east a little bit and see our new Justice Building, because you are the man that got it built.

I remember very well when we were stymied and stagnant, and we couldn't get it moving, one problem or another prevented it. And you came down here as head of a subcommittee, as you have done here today, and we had hearings, and you got your forceful personality and interest behind it, and in a little while we had a Justice Department Building. And we just want you to know how much it means to us in this area, and how grateful we are to you. So you be sure to go by and see your Justice Building before you leave.

Mr. LEVITAS. I will try to do that.

Mr. PEPPER. Mr. Chairman, we are all very proud of our mass transit system. It is aborning and soon will come to full birth. I am sorry that something prevented me this morning from joining all of

you in making the trip on the mass transit system. I am told by Mr. Shaw that it is better than the one in Washington, and we are proud of that.

We are grateful to you for coming, Mr. Chairman, and members of the committee, because we have been troubled by some of the accusations and charges that have been made about this project. You know other than being proud of this project, we are proud of Bill Lehman, who is the father of the project as far as we are concerned here. Bill Lehman has labored long, hard, and unceasingly to bring this great rail system into full fruition for our people, and we are very grateful to him and very proud of him. But we also have confidence in our local board of commissioners, and in our county manager, Mr. Stierheim here, and in the lovely lady who is the chairman of the subcommittee that has been responsible for the county's supervision of this project.

We had a briefing in Washington not long ago by our county authorities, and they went over all this ground. You are not, of course, to prejudge either side. We are delighted you are here, because we feel that you have been involved in the development of the program so much that you can come as an objective observer, in the exercise of your oversight function, and determine what is right and what is fair.

Of course, we want every dollar that is spent to receive a dollar in value, and we don't want any jeopardy in this system for the passengers that will hereafter be using it. We don't want our community, after its sacrifice, and the Nation having made the great contribution that it has made, to be disappointed in any way.

Of course we don't want to see that. We are just so glad you are here, because we feel that you will add a competent, objective, fair observation to this project, and whatever you finally say and conclude we feel will be the facts, and I hope the public and everybody will accept them as they come from you.

We are delighted you are here. We have provided our usual sunshine for you. We hope you will have a happy stay as well as do a very valuable duty in the service of our community and our country. Thank you all very much.

Mr. LEVITAS. Thank you, Claude, for your comments and those remarks about the mass transit system here. As you suggested in your remarks, we are one Nation. We may have our own communities and our own State or local interests, but we have a common bond, and that is what brings us here today.

As we have all made reference earlier in our comments, the person who really deserves a great deal of credit, in fact the credit for focusing our subcommittee's attention on not just this particular community but on the entire question, is someone who has played an important leadership role in the Congress in the entire area of transportation. Bill Lehman is respected by his colleagues, and is someone who has, through his personal efforts, made a tremendous contribution to building the overall transportation system that this Nation enjoys today.

Mr. LEVITAS. Bill, I want to thank you for being with us today, sitting as part of this panel, and I will now recognize you for purposes of making your presentation and statement.

STATEMENT OF HON. WILLIAM LEHMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF FLORIDA

Mr. LEHMAN. Thank you very much, Mr. Chairman, for being here, for your kind remarks. I want to thank the distinguished ranking member, Mr. Molinari, for also being here, as well as the other members of the subcommittee. Especially, I appreciate the fact that my dear friend Senator Pepper is with us today, and there is only one Claude Pepper in this whole United States. It is certainly a privilege to have him as part of our State delegation.

As the Transportation Subcommittee chairman on the Appropriations Committee, we have the responsibility for appropriating money for transportation throughout the United States, and I just want to let the chairman know that we both need and appreciate this oversight and investigative effort by your committee, to assure that the money that we appropriate is well spent.

I also want to welcome the committee here on behalf of the entire Dade County delegation. As I mentioned, our delegation includes the distinguished chairman of the Rules Committee, my dear friend Claude Pepper, and Dante Fascell, who will be the new chairman of the House Foreign Affairs Committee, and a newcomer, who is also a very polished member, Larry Smith, who also represents a part of Dade County.

We all welcome you here not to "Paradise Lost," but to "Paradise gained and regained" by the kinds of efforts that we are making here in Dade County. I think part of that paradise you have already been able to see this morning.

I also welcome you here as one of the 2 million people in Dade County who are going to be paying their taxes, and have been paying their taxes, to support this public transportation system. We want to see that the citizens of south Florida will get a cost-effective operation of the Metrorail system, and we need your help to see that we do our duty in that repsect.

Thank you for being here. It is a privilege to sit with you on this panel.

Mr. LEVITAS. Thank you, Bill. And I will say to you as well as to Senator Pepper that I want you to feel free to participate in the proceedings fully today as a member of this panel.

The first group of people we are going to hear from this morning are the officials here in Dade County who have had hands-on experience and are the people who have brought this project to where it is today. We are, as I have already indicated, very appreciative of the hospitality we have received and of the cooperation which our professional staff has received in arranging for these hearings.

What I thought we might do is hear first from Mrs. Oesterle and then from Mr. Stierheim and Mr. Higgins, before we get into questions, unless, Mrs. Oesterle, it is necessary for you to leave.

Also let me say this, because I don't want you to think you have been singled out for any special attention. This is an investigative subcommittee. Under our rules, all testimony before this subcommittee is testimony received under oath. So when I administer the oath to you, I don't want you to think that that is for some special

reason unrelated to our normal operation. With that, if all three of you would raise your right hands, please.

[Witnesses Oesterle, Stierheim, and Higgins were sworn.]

Mr. LEVITAS. Thank you very much.

Again, Mrs. Oesterle, in your capacity as chairperson of the committee on transportation of the Dade County Commission, you play a key role. We are all looking forward to your statement this morning and you are recognized.

TESTIMONY OF CLARA OESTERLE, DADE COUNTY COMMISSIONER, CHAIRPERSON, COMMISSION'S TRANSPORTATION COMMITTEE; MERRETT R. STIERHEIM, COUNTY MANAGER, METROPOLITAN DADE COUNTY; AND WARREN J. HIGGINS, EXECUTIVE DIRECTOR, METROPOLITAN DADE COUNTY TRANSPORTATION ADMINISTRATION, ACCOMPANIED BY ALAN C. WULKAN, DIRECTOR, OFFICE OF INTERGOVERNMENTAL ADMINISTRATION, CHARLES D. SCURR, SPECIAL ASSISTANT TO THE TRANSPORTATION COORDINATOR, AND WILLIAM McDANIEL, SUPERVISOR OF CONSTRUCTION

Mrs. OESTERLE. I want to say good morning again, Mr. Chairman, and welcome to all of you for being here with us. We are indeed grateful to have this opportunity to testify before you. We feel that this is indeed a good project. I think in taking the ride this morning and seeing what you saw, it is more than thousands of words could ever convey. I don't think that anything that we could say here today would be as impressive as the ride you took this morning and what you really saw for yourselves.

I, too, want to reiterate our gratitude to Congressman Lehman. Without his help this would not have been possible. It was said before that we did not want to hold these hearings in Miami. I want to say to some of our press, I want you to know that is not true. We welcome you here, and I feel that before the day is over, you, too, will see that this is a great system, and maybe we can all learn from what we have to say today to each other. So we say welcome, and we will get on with the hearings. Thank you.

Mr. LEVITAS. Thank you very much, Mrs. Oesterle.

Mr. Stierheim, would it be appropriate now for you to make a statement and then to hear from Mr. Higgins?

Mr. STIERHEIM. If that is agreeable, that is how we plan to proceed, Mr. Chairman.

There is a formally prepared statement that has been submitted. I will try not to be too redundant.

Mr. LEVITAS. Let me then say that your prepared statement will be made part of the record in its entirety, without objection. You may proceed.

Mr. STIERHEIM. Thank you. Let me just briefly describe metropolitan Dade County to you. I think that is relevant. We are a very diverse community; we are an international community. To the south we have agricultural, an agrarian economy. We have retired people. We have an industrially diversified community. We are heavily dependent upon tourism. We have people from all ethnic groups here, and it is a tremendously exciting place to live.

Metropolitan Dade County government was created back in 1957, and in essence what the voters of this county did was create a home-rule charter, which empowered the mayor and eight county commissioners with broad authority that transcends the traditional dichotomy between county government and city government. We do have 27 cities, the core being Miami, Miami Beach, Hialeah, Coral Gables, and so forth, but the county government is responsible for the regional concerns and needs of our cities, particularly, for example, in the area of transportation, highways, bridges, roads, and traffic control. All are consolidated under the county.

The airport, the seaport, and Jackson Memorial Hospital, which is administered by a trust but is still a part of this county government, also are part of it. Commissioner Oesterle serves the hospital trust in an official capacity.

Our employees total approximately 21,000. Our total capital and operating budgets, proprietary budgets for all of the facilities and direct line services, is about $1.3 billion, so it is a large and complex organization that I think, not subjectively but objectively, renders very effective and cost-efficient service. It is larger than about 15 or 16 States in terms of its size. We have a permanent population of about 1.7 million people, and with tourists and the transit population we have over 2 million people at any time of the year.

I would like to begin, and I think I will move this over so Congressman Lehman can see these charts, with some brief graphics. Can everyone see them now?

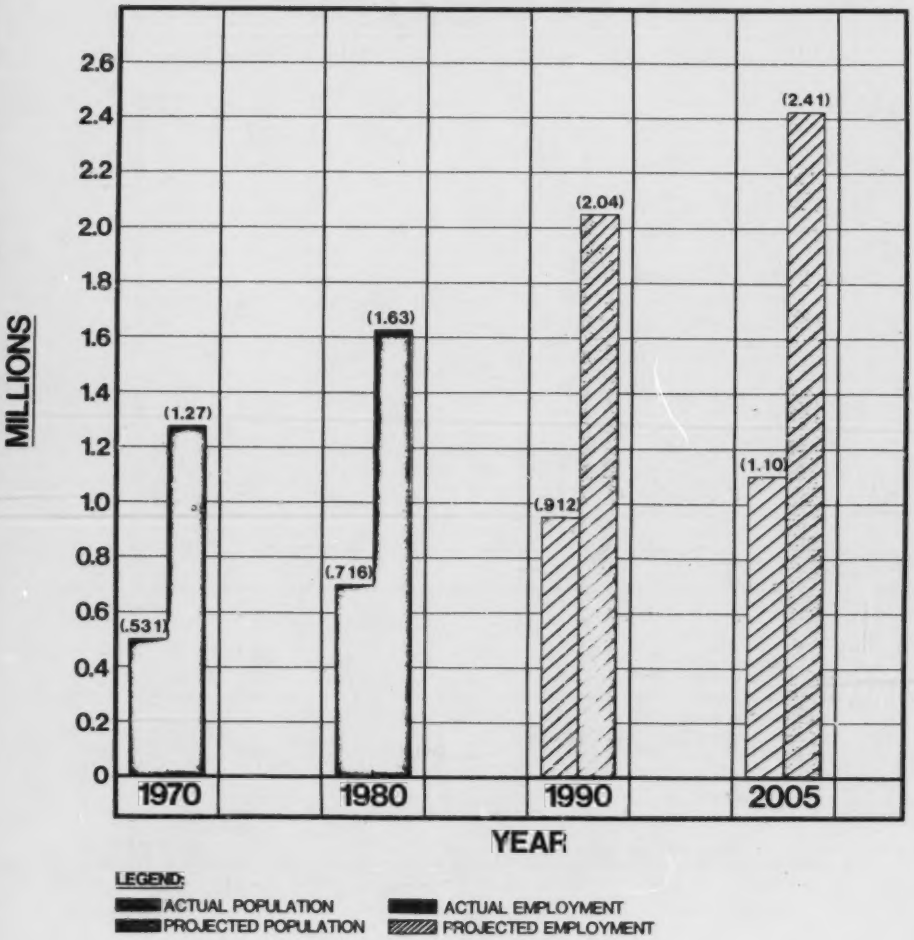
Essentially, this will give you a little more background on the county. Here we have population and employment for Dade County. This goes back to 1970. Your employment is in green, and your population roughly 1¼ million, a little better than a half million employed. In 10 years we had jumped, by 1980, to 1,630,000, with 700,000 employed, and we are projecting by 1990 to be in excess of 2 million people, with a little less than half, about 900,000 employed, and on out to 2,005.

We have, as Congressman Shaw here can attest, a fairly high density of populations, which certainly support public transportation. The reason for that is that we are bounded on one side by the ocean and the other side by the Everglades and the inland swamps of Florida. But this region where most of our people live is relatively densely populated, and you can see here that our population per square mile of developable land is almost up to 5,000, about 4,730.

We are behind New York and Los Angeles, but ahead of Chicago, San Francisco, Washington, and other major urban areas. I think that is of some significance, particularly when you analyze the corridors over which our transit operation flows.

[The following was received for the record:]

POPULATION & EMPLOYMENT IN DADE COUNTY



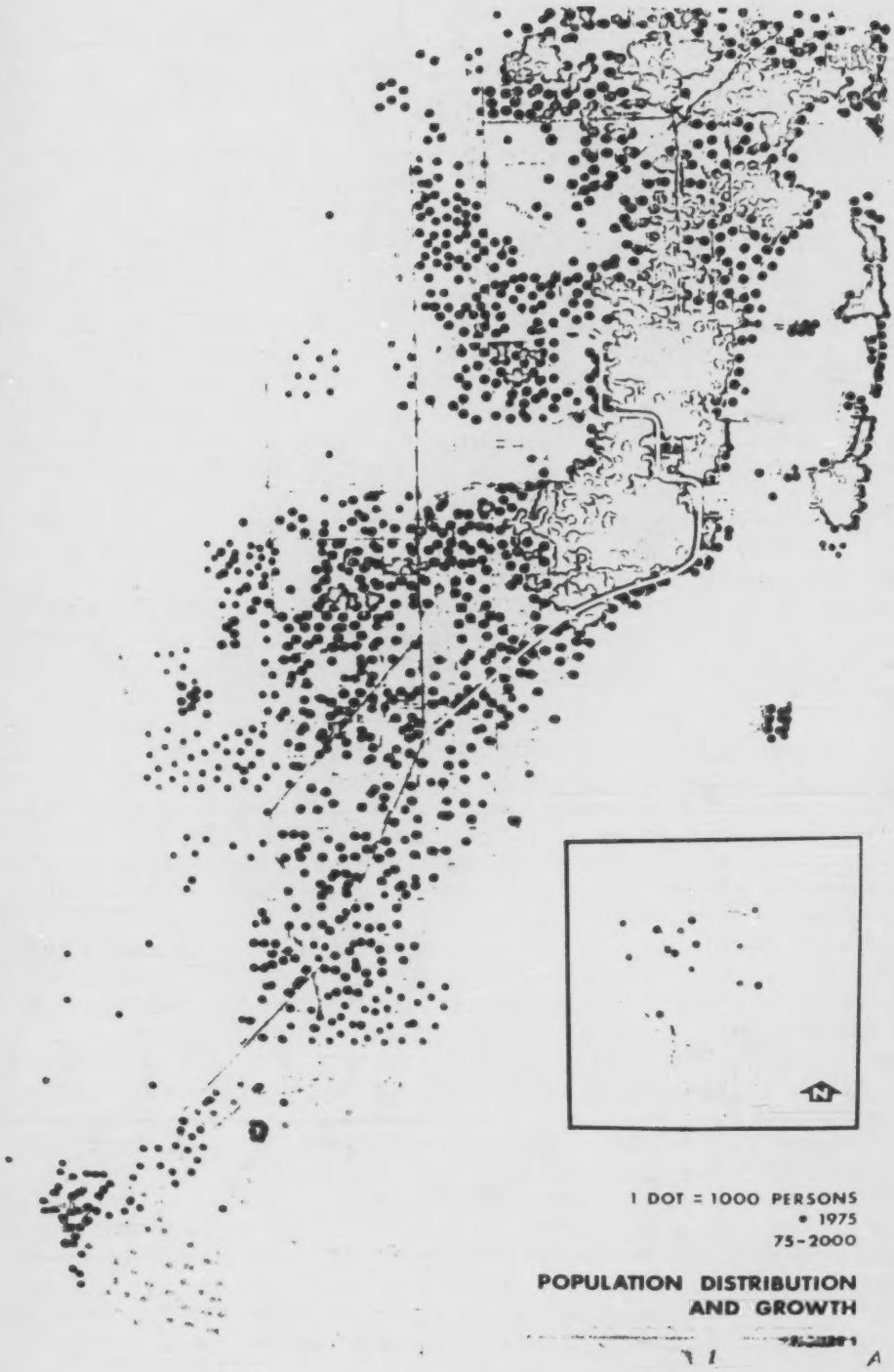
POPULATION DENSITY PER SQ. MILE FOR SELECTED STANDARD METROPOLITAN STATISTICAL AREAS (SMSA)

SMSA	POPULATION PER SQ. MILE
NEW YORK	5,552
LOS ANGELES	5,189
MIAMI	4,730
CHICAGO	4,526
SAN FRANCISCO	4,008
WASHINGTON	3,424
BOSTON	3,126
HOUSTON	2,300
DALLAS-FORT WORTH	1,915
ATLANTA	1,783

DECADE OF PROGRESS BOND ISSUE (APPROVED IN NOV. 1983)

BOND PROGRAM	BONDS AUTHORIZED
SEWERS	$ 50,000,000
SOLID WASTE	50,000,000
UNIFIED TRANSIT	$132,500,000
HEALTH CARE JMH PRIMARY	 77,400,000 11,200,000
LIBRARIES	34,700,000
PARKS	75,800,000
ZOOLOGICAL PARK	8,000,000
STREETS & SAFETY ARTERIAL ROADS	 98,600,000
TOPICS	14,900,000
TOTAL	$553,100,000

No. 4



POPULATION DISTRIBUTION AND GROWTH

Mr. STIERHEIM. These charts bring back memories, a little deja vu, if you will, because in 1977 we had a referendum on our transit system. We began with one in 1972, when the voters of this county, with very high confidence, adopted a Decade of Progress bond issue of some $500-plus million, which really provided the infrastructure to make this a great community, with hospital facilities, water and sewer facilities, roads, libraries, regional parks, and the transit system itself.

This program, as I say, was approved in 1972, and these are the areas that it funded. Of particular interest to this committee is the fact that the voters of Dade County agreed to tax themselves for $132 million in general obligation bonds to provide the basis for reaching out for the Federal dollars and State dollars to build this system.

The reason I said this chart brings back memories is that we used it when the entire system was under challenge in 1977. A provision of the home-rule charter provided that one could, with 10,000 signatures, cause a referendum on any issue through initiative proceedings here in the county, and we have had a plethora of referendums, from gay rights to casino gambling, to millage rollbacks, to the question on transit.

Each black dot on the population chart represents approximately 1,000 people. The red dots indicate our projected growth. You can see the growth patterns to the south. I think some of you were asking about the extension of the system. Congressman Nowak was asking about that toward the south, and that will certainly become a reality in time, and also to the west, where we are analyzing the second phase.

The transit corridor flows right through here, and I would point out at this time that we are ready as soon as this system opens to totally change the bus configuration from the traditional north-south-east-west grid system to a bicycle-spoke system, which will bring the public into the stations along the south and ultimately along the north leg that you visualized this morning. But you can see how this heavy population density is embraced by the transit corridor.

Now I would like to show you jobs, and I think this is even more significant. This is where people work. We started out down at Dadeland South, which is growing tremendously, and again we have the same black and projected red dots. We moved up the south system, you went by the University of Miami, and the Coral Gables area. Here is the Coconut Grove area, where we have a station.

You come into the heavily employed downtown area; immediately over here we have Jackson Memorial Hospital and the public buildings, the jail and court facilities, which employ about 40,000 people, and then you move out, and on your luncheon tour today you will go to the north leg. You move out into the industrially diversified Hialeah area, and ultimately out to Okeechobee, but you can see, I think, graphically how the system moves over the high employment centers of Dade County as an indication of how much service it will provide.

We have a running debate with Los Angeles as to who has more automobiles per family, and I am not going to say who is ahead at

this point. I am not sure that is a desirable statistic, but we do have an extremely high level of automobiles per capita in Dade County, and autombile trips. In 1970, these are in billions, we had almost 2.5 billion; by 1980, 10 years later, we had gone up 1 billion trips, and we are projecting 4.26 billion by 1990 and 4.97 billion on out to 2006.

The reason I say this is that, for example, as you came along the south leg this morning, you were running along U.S. 1. U.S. 1 was designed for about 40,000 cars. It is running at about 80,000. For those of us that commute on it daily, sometimes we call it "useless one," although it is a vital link connecting with downtown.

I-95 is certainly one of the most heavily traveled expressways in the United States. So the demand and movement of people is here, and we think our projections on ridership on the transit system are conservative, extremely conservative. We won't realize our projects the day we open. That will come with the light rail component downtown, and when we open the entire line to the Hialeah area.

Let me take a moment and explain my responsibilities. The mayor and county commissioner by that charter appoint a county manager, who serves as the chief executive officer of this government. The departments that I mentioned, the airport, the seaport, Mr. Higgins in transportation, and so forth, are all departments of this administration.

I believe there is an organization chart that has been handed out, which will give you some indication of the major activities that I am responsible for. I do have responsibility subject to the policy decisions of the commission, for overall direction of the county government, for carrying out its budget, and seeing that the goals of the commission are met.

I might add also that Commissioner Oesterle serves as the chairperson of the transportation committee. We have broken the eight commissioners and the mayor into various committees, similar to this committee, and they function in a legislative and policymaking role, which goes beyond the traditional city manager-council manager form of government.

It brings the elected official more into the formulation of policy and into more of the day-to-day, week-to-week direction, which I think is a healthy process in a government as complex and large as this. This transportation committee, which has three other commissioners besides Commissioner Oesterle, is probably the most active, meeting about every other week.

We have a policy of total and complete disclosure. There are no secrets. If there is a problem on this transit system, it is Warren Higgins or myself or our consulting engineers that are blowing the whistle, saying, "Hey, wait a minute, we have a problem."

I am proud of what we have done and I am proud of what Commissioner Oesterle and the elected officials have done. There has been heavy involvement by the elected officials in this county in this system.

Obviously I have financial accountability. I might stop for a moment on the subject of independent audits. One of the problems we had somewhere in midstream was an overrun. This worked out to be about 6 percent of the cost of the entire system. We started

out at $120 million. We made some cuts and adjustments, and we worked it down to the point where it was about $62 million.

That is 6 percent of a $1 billion system, at a time when we were running 22 to 24 percent in construction inflation, at a time when we were assimilating 50,000 Haitian refugees, who were driving up the costs of right-of-way acquisition, and housing, and so forth, and at a time when there were a lot of mitigating factors.

Be that as it may, I think we could have known about that earlier if the auditing function had been removed from DCTA at an early stage. I made the decision to pull the auditors out of DCTA, who were federally supported and locally supported, so that I now have a watchdog agency on the purse-strings of this department, on the cash flow, and so forth, which gives me, and I believe Commissioner Oesterle and the county commission, more comfort in the projection of our figures and so forth.

Also, there is the integration of this system into the county service. I won't spend any time on that, but that involves classifications, standard operating procedures, and so forth.

Last, we go to the subject of quality assurance, and I might add also, you talked about the investigation, Mr. Chairman, which the Inspector General for DOT began when he sent somebody to this town. And I heard that that individual was in town. I asked to see him. He came to my office. Through the sheriff, who is a department head responsible through me to the county commission, I assigned detectives, and they have collaborated with the Inspector General.

So I want you to understand that Metropolitan Dade County government has been a part of that investigative process and is deeply involved in it now. We could spend a lot of time talking about that investigative process because it has had a debilitating effect on morale. I think Warren Higgins can talk about that. There is an up side and a down side, and I am not suggesting we condone anything. If there is a problem out there, we will get at it. We have already done that. We have had some cases already where we have entered into prosecution. I want to talk about quality assurance as we go on.

Now let me talk about some issues which I think are getting into the basis for this committee's presence. We have had an outstanding relationship with UMTA. I have worked with the present administrator, whom I am particularly impressed with, and I am looking forward to working with in the future. I have worked with several predecessors in the 7 years. I am in my eighth year now in this position.

When we got into the Inspector General review, and then subsequently got into the TSC report, I would have to admit that we got into a strained relationship, which I think we are now past. I think now—and I am not being utopian or unduly optimistic here—we are working extremely close with both the administrator's office and the regional office.

There has been very effective communication with the regional office. They have assigned what we consider to be an outstanding engineering firm to provide some oversight responsibilities, which we requested in our response, and that individual in fact, Mr.

Chairman and members of the committee, sits in on my staff meetings. I mean there is heavy involvement.

I have a staff of 52 people who perform quality assurance reporting directly to me, and through me to Commissioner Oesterle and the members of the transportation committee, and ultimately to the commission. They work closely with Mr. Higgins, but they are not responsible to Mr. Higgins. They are independent from Mr. Higgins. They are out running checks to make sure that construction is in accordance with specifications, that the testing that is being done is being done properly.

In other words, it is a totally separate quality assurance system as differentiated from quality control, which is sort of before the fact. Quality assurance is after the fact, to assure me and to assure your administrator and the Congress and everyone else involved that the dollars that are being spent are spent appropriately.

I am proud of that system. I think it is a first in the country. We have had quality assurance on other transit systems, when we talk about safety systems, communications, fire control, and so forth, but I don't believe we have ever had a quality assurance system that goes into the actual construction phase.

This represents a lot of work, and we thought it was necessary, because there is no secret that the TSC report was critical. Our response is a matter of record. I don't intend to go into that. I think that is past us. I think that while we disagreed with certainly the vast majority of the conclusions of that report, and I believe that the facts and the evidence is there to substantiate the county's position, there were benefits that came out of this. There are benefits that come out of adversity, even though at the time it is a painful process.

Certainly we have beefed up the inspection, not only the field inspection but the quality assurance. That is a positive thing. I think the taxpayers not only here but around the country can take comfort from the fact that we are doing that.

I think I can state without any hesitancy of contradiction that this system will be the best tested, the most scrutinized, certainly the safest. We think it will be the lowest cost, one of the lowest costs per mile of any constructed in the country. We think it's maintenance costs will be the lowest, and speaking as one who has shared the griddle, so to speak, of public exposure, I am very comfortable in saying that.

I don't know whether you could sense it when you rode the system with us this morning, but we are proud of it. We really think that it is an outstanding system, and that in spite of the fact that it has become a media attraction, and that is essentially what has happened. I am not suggesting we didn't have problems; I am not saying that we didn't need to beef up inspections and so forth; I am not saying that there isn't a design problem on the roof of that building where you left the train; the designers admitted it. We have got the design fix on now. It is a question of going out and fixing it to specification.

We are running the tests on the hammerhead piers, and the test results are just fantastic, 65,000 pounds, almost 32 tons of pressure more than was designed before we had any failure.

Let me say something else. There is absolutely no question about the safety of this system. That has never been an issue. It was never raised by TSC. Our studies have demonstrated it. With the tests of those hammerhead pier caps you will see that today, and I think it's important you understand it.

The design criteria said if there was a derailment, in the unlikely event that there was a derailment, and you had a maximum impact on one hammerhead pier by the car, the design criteria is that there be no appreciable damage in that hammerhead pier cap. The reason for that is that we can set the car back on the track and not have any discontinuance of service, where we would have to go out and repair the break.

What you will see today was how we went out and put 500,000 pounds, 250 tons of sustained weight on that hammerhead pier, to make sure that that criteria were met under different locations of the steel, and that is all being analyzed by the independent engineers, and monitored by Kent Larsen, who is the Morrison-Knudsen representative here working directly for UMTA and closely with us. So I can assure you that there are all kinds of people testing that. That is what is being tested. The safety of the system is unquestioned. I think that is important.

Mr. Chairman, I hope that I have given you an overview. Mr. Higgins in his presentation will go into more detail. We are certainly here at your convenience to answer whatever questions that you might have. I might just stop on the last one, which I guess is the bottom line.

In our response to the TSC report, we recommend that quality assurance become a requirement, and your administrator can comment on this. I think there is certainly some receptiveness to this point, that it become a local requirement that a quality assurance team be established early on to provide the kind of service that Jack Crognale and his staff are providing now to Warren and myself and the Commission. I think it's good protection.

It's good assurance to UMTA, the administering agent, and to the public, that the design criteria and construction meet what was specified. I think that single action, where you may have a project and you can set a criteria of $100 million or wherever—I don't know, whatever is appropriate—that the receiving agency, whether it's a city or county or who, be required to set up a quality assurance team that would report outside of the line authority.

In other words, here it would report to me or even to the elected officials, or through me to the elected officials and also, simultaneously of course, to the director, and if it were an independent authority, then maybe it would report to whoever appoints that authority. I think that can be worked out.

As to UMTA's direct and participative oversight responsibility, certainly a provision could be made that the quality assurance reports were provided to the regional office, where they could be reviewed. Another option would be to allow UMTA to contract with an independent engineering firm to review what quality assurance was doing, and so forth, and report simultaneously to the local entity and to the regional office.

I like the idea of the shared reporting system, because let's face it, we are in the business of building the system, and we want it

built. We want it built so we can walk away from it and be proud of it. So I like the idea of mutual reporting.

I think that generally covers where we are at, Mr. Chairman. Thank you.

Mr. LEVITAS. Thank you very much, Mr. Stierheim. I have got a number of questions, but I think it might be best if we heard from Mr. Higgins first.

[The statement of Mr. Stierheim follows:]

TESTIMONY OF COUNTY MANAGER MERRETT R. STIERHEIM

Mr. Chairman, members of the committee, I want to welcome you to Dade County. We are looking forward to working with the House of Representatives Public Works and Transportation Oversight Subcommittee in helping to define the Federal Government's role in the construction of public transit systems. I believe we may be uniquely qualified to discuss this issue in that I know of no other transit system in the United States which has undergone the close look applied to Dade County's metrorail project. We have had our own aggressive construction management programs, a special local investigator general who reports directly to me, an independent county audit agency, the United States Investigator General's Office, the Urban Mass Transportation Administration, the Transportation Systems Center Special Study Team, the Miami Herald, and other media as well as many special consultants all conducting various levels of oversight on this project. Yet through all of these reviews, metrorail has been proven to be a safe, efficient and cost effective solution to Dade County's urban transportation problems.

I hope the ride this morning is testimony that the system will prove itself once people begin to use it.

The purpose of my testimony is to provide you with background on metropolitan Dade County, the political and administrative challenges encountered during the development of this country's newest rapid transit system and what, in my judgment, is the role of UMTA in the construction of transit facilities. Following my testimony, Mr. Warren Higgins, executive director of Metro-Dade Transportation Administration will discuss in detail the important construction issues and lessons learned in the development of our transit system.

BACKGROUND

The population of Dade County has grown from slightly less than 500,000 (495,084) in 1950 to more than 1.6 million (1,625,791) in 1980.

Our current estimated population is 1,739,000. The influx of Cubans fleeing communism in the 1960's pushed Dade's population over the million mark. Another population surge occurred in the late 1970's and in 1980 with the migration of Haitians and as a result of the Cuban exodus from Mariel. If current growth trends continue, population should double to approximately 2.41 million by the year 2005.

In 1975, the BCC adopted a comprehensive land use master plan which is dedicated to allocating land use such that it guides the physical, social, cultural and economic needs of the community. This plan stresses both the protection of existing residential areas from encroachment by industry and the protection of our county's extensive environmentally sensitive areas. Construction in central, densely populated major activity centers is encouraged. The plan also identifies transportation corridors for future development throughout Dade County.

Through the implementation of the land use master plan, Dade County has become one of the most densely populated urban areas in the United States. The county is over 2000 square miles with only 350 square miles of urban area. Current densities within the SMSA average 4,730 people per square mile with densities over 10,000 people per square mile on Miami Beach.

The Dade County work force is concentrated in central/downtown Dade County, central Miami Beach and the airport area which extends into west Dade, with 10 or more employees per acre. A great majority of the population commutes from outlying areas into downtown, causing severe traffic during rush hours. The work force is expected to increase from 716,000 to 912,000 by 1990.

INSTITUTIONAL FRAMEWORK

Our county government functions in a two-tier governmental system with the dual responsibility of acting as the only governmental body for Dade County's unin-

corporated area and also providing services for many of the residents of Dade's 27 municipalities. The county has 17,000 employees in 50 major departments with an annual operating budget of $947 million (FY 83-84) plus another 5,000 employees at Jackson Memorial Hospital Complex. Metro-Dade County government is responsible for operations which in other areas are more usually handled by a city, an authority or a multi-jurisdictional agency.

Some of the services provided by metropolitan Dade County include:

Miami International Airport.—A county department handling 20 million passengers a year, with more international flight operations than any other U.S. airport. It ranks second only to New York's JFK Airport in international cargo and is fifth in the world in total cargo.

The Port of Miami.—The world's largest cruise port and second to New York in commercial tonnage.

Jackson Memorial Hospital.—The largest health care facility in the southeast and fifth largest in the Nation.

Metrozoo.—One of the Nation's newest and largest open zoos.

Other departments with county-wide responsibilities include voter registration and elections; traffic signalization and controls; bridges, expressways and arterial road maintenance; county-wide parks; golf courses and other recreational areas; and, of course, transportation the subject you wish to hear about today.

Dade County is responsible for the construction and operation of metrorail our billion dollar rapid transit system being built with some 70 per cent Federal support; for the construction and operation of metromover, our downtown people mover system which will be the first in the world to connect directly with a rapid transit system in a downtown metropolitan area; and metrobus our modern bus transit system which is providing essential service now and which will be modified to provide excellent feeder service to metrorail and metromover systems. We also handle a special transportation service for elderly and handicapped persons, administer the taxicab industry in the county, and coordinate other transportation services.

In other areas, the county provides police, fire and emergency communications for 22 of the 27 cities in the county; oversee environmental services; provides trash pickup and disposal services; and performs many other services most usually provided by a muncipality.

In fact, of the 1.8 million people in Dade County, more than 850,000 reside in unincorporated Dade County, which would make it the largest city in Florida if it were to be incorporated.

Eight elected county commissioners and the mayor constitute the governing body of metropolitan Dade County. These nine officials serve four-year terms as part-time policy setters earning $6,000 a year. Eight of the commissioners are elected on a county-wide basis although each member resides within a specific geographical district. The mayor is also elected county-wide, but may reside anywhere in the county.

The Board of County Commissioners is a policy making body. They set policy for such items as metrorail and metrobus fare, the design and length of the systems, budgetary expenditures for buses, route services, bus shelters and other related concerns. My office carries out these policy decisions by establishing administrative orders, internal procedures, organizational structures and budget recommendations. As county manager, I am responsible for managing the apparatus of county government, making day-to-day decisions and, of course, carrying out the policy set by the board. I am in charge of county staff which utilizes the civil service systems, and of various departments which report directly to my office.

TRANSPORTATION SYSTEM

In Dade County, the road network is composed of nearly 5,600 miles of expressways, arterial highways, collector roads, and local streets. Expressways, arterial highways and collector roads accommodate over 90 percent of all vehicular travel, but constitute less than 15 percent of the total roadway miles. The responsibility for maintaining and improving expressways and major arterials belongs to the Florida Department of Transportation [FDOT] while the responsibility for maintaining and improving minor arterial highways and collector roads belongs to either FDOT or metro Dade County, depending on the specific function of the road. Local roads are either handled by municipalities or by metro Dade County in unincorporated areas.

In 1980, over two-thirds of all highway travel in Dade County encountered congested or extremely congested conditions. Approximately 5.2 million vehicle-miles of traffic in 1980 experienced extremely congested conditions.

In Dade County, I-95 carries the highest traffic volume in the county. I-95 was designed to carry 96,000 vehicles per day and averages over 140,000 vehicles per

day. In 1980, the Palmetto Expressway (Fl. 826) carried approximately 105,000 daily vehicles and the Dolphin Expressway (Fl. 836) about 100,000 vehicles per day. All expressways combined carry approximately 35 percent of the total traffic in the county.

A number of the arterial highways also accommodate high traffic loads. South Dixie Highway, for instance, carried in 1980 over 60,000 vehicles. In 1982, metrobus served over 62 million passengers and provided about 24 million miles of bus service in Dade County. On an average weekday, the transit system carried approximately 213,000 passengers on over 1,580 route miles (one-way). An average of 437 buses provided service during peak rush hours.

Recognizing that no one transportation system can meet the needs of all our citizens, the county is committed to a multi-modal or balanced transportation system using local and express buses, jitneys, taxis, bike paths, metrorail and metromover. The county master land use plan and its emphasis on activity centers is used to provide the backbone of our multi-modal transportation system.

THE POLITICAL CHALLENGE

In 1972, Dade County voters demonstrated concern for the growth of their community by approving a $132.5 million decade of progress bond issue which provided local share funds for a balanced transportation system including construction of a rapid transit system along with an expanded bus service to support the system.

Responding to the needs of over 1.0 million residents, Dade County sought to move ahead as the first major metropolitan area in Florida to solve its public transportation problems by building an elevated rapid rail system. Dade County further sought to systematize all ground transportation into a unified transportation improvement program which would include rail, buses and a downtown people mover.

Plans progressed smoothly until 1978, when citizens petitioned the county commissioners for a referendum to halt all further spending on metrorail. The issue was put on the ballot for March 1978, and after a hard fought campaign, the attempt to repeal the bonds approved in 1972 was defeated.

By 1981, the Metro-Dade Board of Commissioners had approved the creation of the Metro-Dade Transportation Administration to oversee all public ground transportation in Dade County. This division of the county government, in addition to reporting to me meets bi-monthly with the Transportation Committee, which is comprised of four commissioners operating similarly to U.S. congressional committees. This committee provides its member commissioners with the opportunity to develop their expertise in particular transportation areas. The committee is given an update on the progress of the transportation programs administered by the Transportation Administration and all significant policy issues are reviewed by the committee with their recommendations being forwarded to the full board for final action. All meetings are held in the sunshine with the full disclosure of all problems, accomplishments and issues regarding our transportation system.

Through the outstanding political leadership of Commissioner Clara Oesterle, Transportation Committee chairperson, and the rest of the committee, we have been able to solve the problems confronting metrorail and keep our program moving in a positive direction.

ADMINISTRATIVE CHALLENGE

It is my rsponsibility to provide overall direction to the Metro-Dade Transportation Administration. Warren Higgins, MDTA's executive director, reports directly to me.

In addition to the normal "chain of command" reporting relationships I have two independent agencies which overlap all other departments. An independent audit department headed by Mr. Andy Vazquez has the authority to go into any other county department to examine its books and operations, in order to insure that all county policies and procedures are being followed. At my direction, the Audit Department has worked very closely with MDTA to further insure the accuracy of all cost projections, to review all consultant contracts, and to keep me apprised of any possible financial problems.

The second independent agency is the quality assurance office whose inspector general reports directly to me. This office is presently concerned almost entirely with the construction of metrorail, but also has similar responsibility for quality of design and construction of other major county projects. This is a relatively new agency which is doing an outstanding job in monitoring the quality of metrorail development.

One other aspect of county administration deserves more detailed discussion and I refer to the organization of the Transportation Administration.

For years, Dade County had two separate transportation departments. The Metropolitan Transit Agency operated the bus system, a fleet of some 500 to 600 buses carrying more than 60 million passengers a year. Later, the Office of Transportation Administration was created to develop and implement a rapid transit program. For the past year and a half we have been in the process of combining these two organizations, and this past July adopted the current structure. Under this structure, the executive director of the Metro-Dade Transportation Administration has reporting to him four line divisions which cover operations, engineering and construction, administration, and systems development. There are also three support divisions which handle equal employment, intergovernmental relations, and special transit services. And off to one side, in a box by itself, is the metromover project, which is currently being built and will go into operation in 1985.

This organization evolved after many possible variations were studied and in part implemented, and I believe we now have an organization which can function efficiently and effectively.

UMTA RELATIONSHIP

Since 1972, Dade County and the Urban Mass Transportation Administration enjoyed an excellent relationship. Following the approval of the decade of progress bond issue and subsequent development plans for a unified public transportation system, UMTA officials pointed to Dade County as an example of wise and prudent use of public funds for new rail systems. This relationship was additionally evident with the infusion of Federal funds to expand the bus system as well as Dade County being selected as a demonstration area for the downtown people mover project which is now under construction.

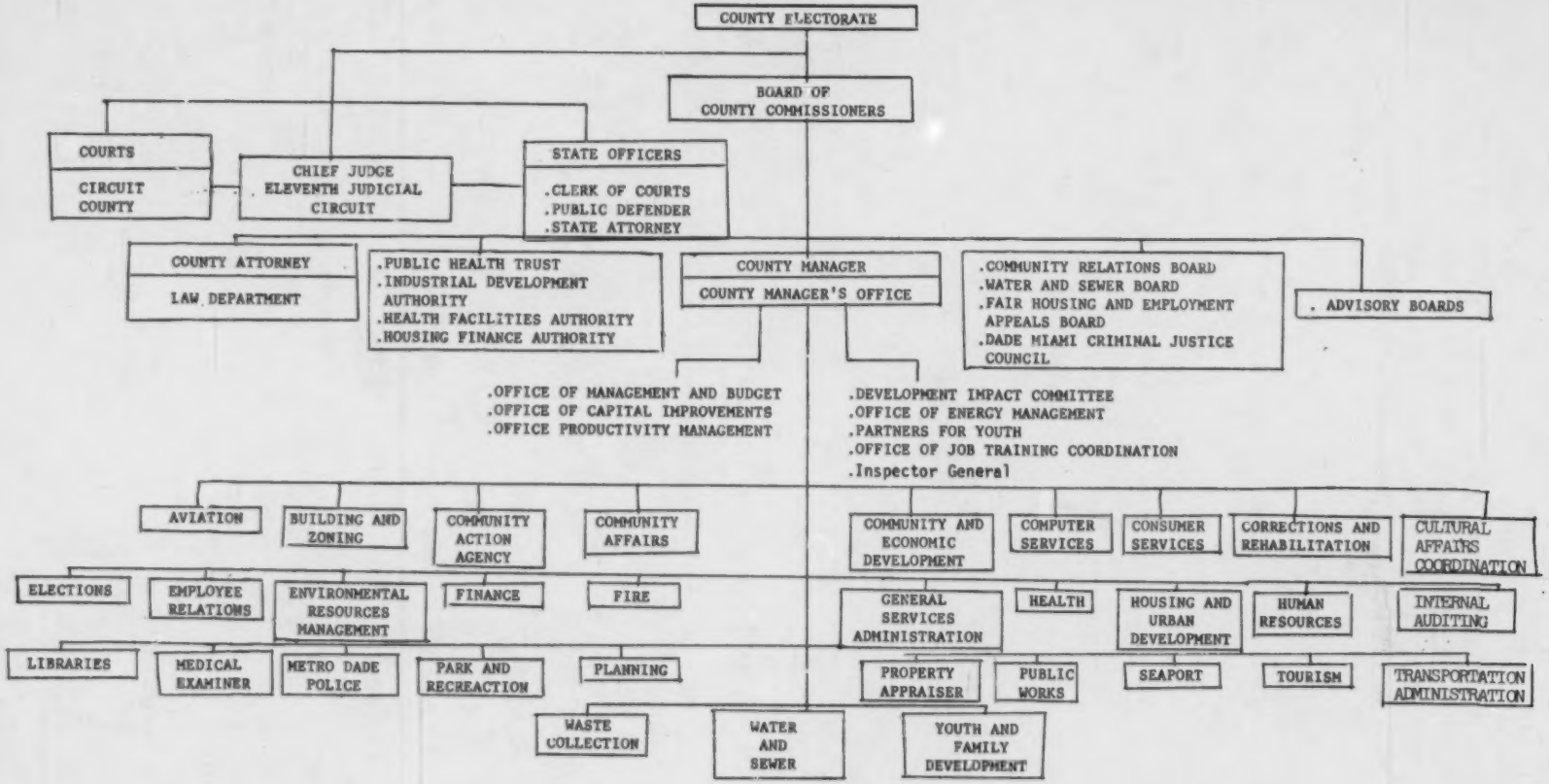
However, as with many major public works projects, problems arose. Specifically, our metrorail project has become the subject of a negative investigation conducted by the transportation systems center. This, coupled with the decline in Federal funding and a shift in national priorities within the last 2-3 years, has strained Dade County's working relationship with the Urban Mass Transportation Administration. Dade County Transit officials are still unaware as to why the IG review was initiated, yet we have made every effort to be cooperative both during and after the review was ordered. Our objections and concerns over the TSC report are a matter at record and our official response is submitted for the record to this committee. I want to make it very clear that Dade County in our judgment has not experienced problems any different than those you would normally expect in a billion dollar construction project. Where problems have existed, we have identified them and taken prompt appropriate action to correct the problem. We have implemented a model quality assurance and control program that is the first of its kind in the United States. There is no question that our system will be one which UMTA and the Federal Government will be proud of. We believe it will be the best constructed, the most inspected the lowest cost per mile with the lowest maintenance costs, and aesthetically the most attractive. As a result of the indepth analysis conducted by the county, I have the following recommendations concerning UMTA's role in future transportation construction projects:

(1) UMTA should require and oversee the implementation of a quality assurance oversight program for all major capital assistance grants. MDTA offers to assist in the development of an appropriate, practical quality assurance program which could serve as a model for new starts and other maintenance for the modernization and expansion of existing systems.

(2) UMTA should have district offices where Federal investments exceed $100m and major construction is involved. These offices can be staffed with a relatively small number of professional personnel who will live with the project on a daily basis.

CONCLUSION

In conclusion, we are very proud of the public transit accomplishments taking place in Dade County. We do not believe our problems are unique; however, where deficiencies are found, they are promptly corrected. We look forward to working with the Federal Government in the future in helping to define the most appropriate Federal oversight role for major public works projects. Hopefully, these remarks will be of some assistance to you in carrying out your most important responsibilities.


COUNTY ELECTORATE
BOARD OF COUNTY COMMISSIONERS
COURTS
CIRCUIT COUNTY
CHIEF JUDGE ELEVENTH JUDICIAL CIRCUIT
STATE OFFICERS
.CLERK OF COURTS
.PUBLIC DEFENDER
.STATE ATTORNEY
COUNTY ATTORNEY
LAW DEPARTMENT
.PUBLIC HEALTH TRUST
.INDUSTRIAL DEVELOPMENT AUTHORITY
.HEALTH FACILITIES AUTHORITY
.HOUSING FINANCE AUTHORITY
COUNTY MANAGER
COUNTY MANAGER'S OFFICE
.COMMUNITY RELATIONS BOARD
.WATER AND SEWER BOARD
.FAIR HOUSING AND EMPLOYMENT APPEALS BOARD
.DADE MIAMI CRIMINAL JUSTICE COUNCIL
. ADVISORY BOARDS
.OFFICE OF MANAGEMENT AND BUDGET
.OFFICE OF CAPITAL IMPROVEMENTS
.OFFICE PRODUCTIVITY MANAGEMENT
.DEVELOPMENT IMPACT COMMITTEE
.OFFICE OF ENERGY MANAGEMENT
.PARTNERS FOR YOUTH
.OFFICE OF JOB TRAINING COORDINATION
.Inspector General
AVIATION
BUILDING AND ZONING
COMMUNITY ACTION AGENCY
COMMUNITY AFFAIRS
COMMUNITY AND ECONOMIC DEVELOPMENT
COMPUTER SERVICES
CONSUMER SERVICES
CORRECTIONS AND REHABILITATION
CULTURAL AFFAIRS COORDINATION
ELECTIONS
EMPLOYEE RELATIONS
ENVIRONMENTAL RESOURCES MANAGEMENT
FINANCE
FIRE
GENERAL SERVICES ADMINISTRATION
HEALTH
HOUSING AND URBAN DEVELOPMENT
HUMAN RESOURCES
INTERNAL AUDITING
LIBRARIES
MEDICAL EXAMINER
METRO DADE POLICE
PARK AND RECREACTION
PLANNING
PROPERTY APPRAISER
PUBLIC WORKS
SEAPORT
TOURISM
TRANSPORTATION ADMINISTRATION
WASTE COLLECTION
WATER AND SEWER
YOUTH AND FAMILY DEVELOPMENT

Mr. LEVITAS. Mr. Higgins, why don't you proceed at this point.

TESTIMONY OF WARREN J. HIGGINS, EXECUTIVE DIRECTOR, METRO-DADE TRANSPORTATION ADMINISTRATION, ACCOMPANIED BY ALAN C. WULKAN, DIRECTOR, OFFICE OF INTERGOVERNMENTAL ADMINISTRATION, CHARLES D. SCURR, SPECIAL ASSISTANT TO THE TRANSPORTATION COORDINATOR, AND WILLIAM McDANIEL, SUPERVISER OF CONSTRUCTION

Mr. HIGGINS. Thank you, Mr. Chairman.

I would first like to start off giving you a very brief summary of my background. I have been the executive director of transportation in Dade County now for about the past 2 years. Prior to that, I was deputy under John Dyer who held that position.

Mr. LEVITAS. Before you get further on that point, the structural picture is not clear to me yet—the boxes on the chart. I understand that you have the transportation committee of the county commission of which Mrs. Oesterle is the chairman. I understand you are the general manager and have general overall supervision.

Mr. HIGGINS. That is correct.

Mr. LEVITAS. But you do not have a separate authority to operate this. And yet on the other hand, you refer to the Dade County Transportation Administration almost as if it were a separate operation.

Mr. STIERHEIM. Mr. Chairman, it is a department. Warren Higgins is the director of transportation which has the fixed rail, the downtown component, the people mover, special transportation service, taxi, all transportation. He is the equivalent of the director of the seaport, he is the department director. He is appointed by me, and can be dismissed by me, and serves in an unclassified service.

Mr. LEVITAS. And so in effect he is a departmental head in the county government.

Mr. STIERHEIM. That is correct.

Mr. LEVITAS. And what you call it, DCTA, is essentially the initials representing that particular department of the Dade County government.

Mr. HIGGINS. That is right.

Mr. LEVITAS. That is a somewhat unusual arrangement.

Mr. HIGGINS. Yes, sir.

Mr. LEVITAS. Looking around the country, and I just want to make sure the record is quite clear on that.

Mr. HIGGINS. The A at the end of it could be confused for authority, but it isn't. It is administration.

Prior to coming to Miami, I was in Boston with the transit authority in Boston for almost 14 years. During that period of time, I held the position as director of operations for 4 years, the executive director of planning, design and construction for another approximately 3 years, and then returned to construction for another 3 years.

I can probably say that the bulk of my time in Boston was really spent first of all in operating the wide range of transportation that they have, all the way from streetcars to commuter rail to rapid transit and buses, to being responsible for the $2 billion moderniza-

tion and expansion plan, and participated in the construction of three heavy rail extensions during that period of time.

Mr. LEVITAS. You might even get into the East Quincy operation as long as you are here today.

Mr. HIGGINS. Well, Quincy one was the first one I started on, and then piece by piece we went further South.

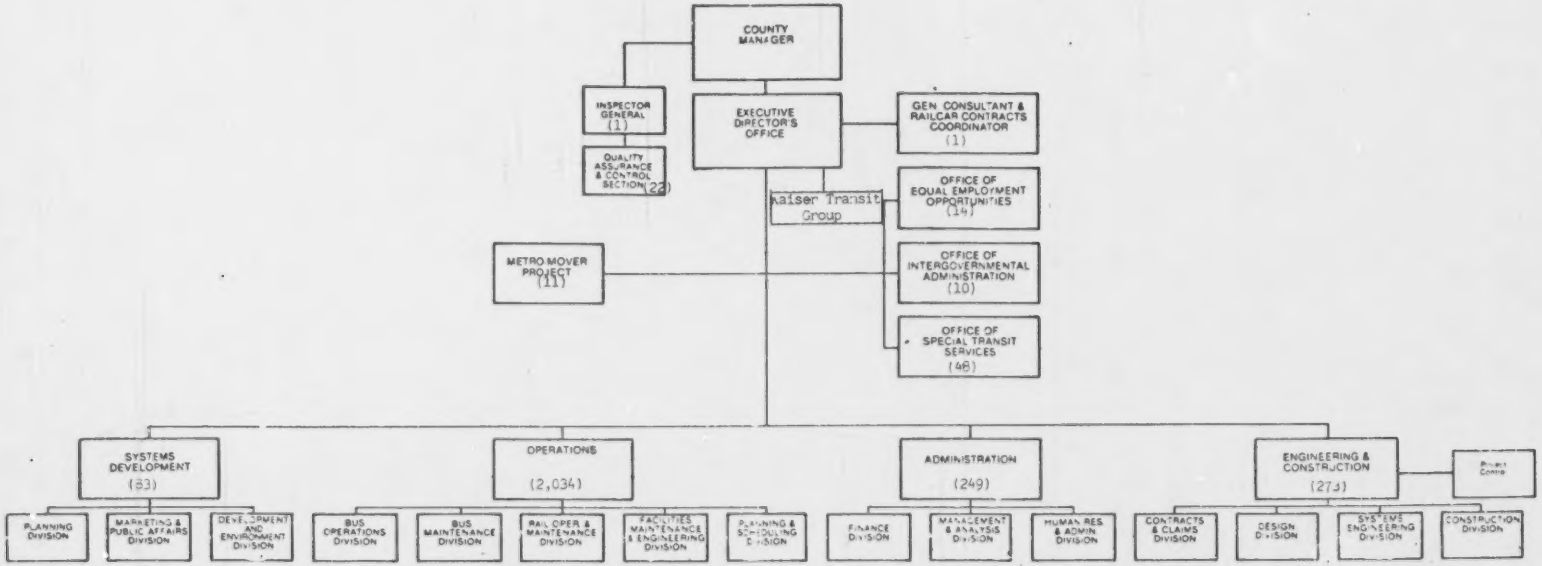
I won't say too much about my Army experience because that seems like another lifetime. I retired in 1965. At that particular time I had served on the general staff in all three theaters. I was the senior executive officer to the last three Army chiefs of transportation, and picked up a tremendous amount of transportation experience while in the Army. I also served on the West Point desk under General Taylor and served as material readiness officer in the USA Pacific before retiring.

With that I will get right into what I am doing here. I would like to start off first of all with this chart I have to my right. It outlines really the key functions which I am responsible for. People, particularly the press, think that Metrorail is the only thing I have to worry about. Well, I worry a lot about it, but besides that, I have the Metro-Mover, Metrobus, paratransit, the joint development program, urban initiatives, and transit planning.

MDTA EXECUTIVE DIRECTOR RESPONSIBILITIES

Metrorail, Metromover, Metrobus, Paratransit, Joint Development/Urban Initiatives, Transit Planning.

METROPOLITAN DADE COUNTY
TRANSPORTATION ADMINISTRATION
TABLE OF ORGANIZATION



Mr. HIGGINS. Now our bus operation is extremely important. In fact, right now it is the only revenue service we have on the street, and people are judging our performance by how well we run our bus system. In fact, I often hear as a complaint, if you can't run a bus, how the heck are you ever going to run a good Metrorail system, so we are putting a tremendous amount of emphasis into building up our entire bus operation. We are now procuring new buses.

We have a different situation in Miami, where a bus will put on twice as many miles in the course of a year as in practically any other major city area. We put about 40,000 miles a year on our buses. Our newest RTS buses are 3 years old. They all have over 190,000 miles on them. They are all ready for a major rebuild. We are ready right now to open a bid package for new buses.

I might also say in the last 4 years, through the help again of UMTA and Congressman Lehman, we have either built or have well along four major bus maintenance facilities. Coral Way is completed and able to maintain 250 buses, north bus maintenance facility is complete and able to maintain 160 buses, central facility is well on its way to completion, and we will break ground very soon on a northeast bus maintenance facility. This is starting from four years ago, when we had practically zero in the way of up-to-date maintenance facilities to achieving by the time we open metrorail to full capacity of having the most modern bus maintenance facilities anywhere in the country. I think that is a real achievement.

Going to the Metro-Mover, the project is going very well. It has a budget of $132 million. We visited Pittsburgh, the Westinghouse plant, 2 weeks ago. We find all of our vehicles are right on schedule, in fact are a little ahead of schedule, and are coming along very, very well. All of the control equipment is ready to be shipped to Miami to be installed in our new administration building, and we are convinced that we will finish construction on the Metromover by the end of 1984. Westinghouse will then take a period of time to test and break the system in before turning it over to us.

Paratransit is one of the areas that requires a tremendous amount of attention, because we are dealing with people that have already been hurt by life. They want to get out once or twice a week to get to a doctor or to get some kind of recreation, so we are trying to use innovative computerized ways to make trips available to get these handicapped people out back into society. Many of them we take back and forth to work every day.

JOINT DEVELOPMENT

You saw a little example of it this morning. We want to do much, much more of it. We feel that joint development is really one of the key answers to helping us meet our operating costs with a minimum deficit, after we lose section 9 money. I think that all transit properties have to look ahead to maximize areas where they can pick up money that will help them operate their railways.

TRANSIT PLANNING

I am chairman of the Transportation Planning Council which each month develops all of the major planning issues, be they

transportation, airport or seaport or highways, to take before metropolitan planning organizations.

I know organization charts can be boring, but I would like to quickly flip through this one. I think this will give you a better idea of the position of the county manager in the organization, also his inspector general, and then where transportation fits in. You can see over to the right of the chart the inspector general complex. Quality assurance comes directly under the county manager.

Now, as the county manager indicated, that team does work very closely with the transportation staff, but their report and their findings go directly to the county manager.

Also showing reporting in to me is the Kaiser Transit Group. The Kaiser Transit Group is with us as a general counsultant on this project. They started out with the entire design effort, the entire construction management system control and system certification functions. Some of that has been curtailed somewhat, and I will talk about that a little later.

We have general consultants for our rail contracts, and then also reporting directly to me is our office of equal employment, our intergovernmental administration office, where all of our requests for Federal money are generated, and then again this very important office of special transit services for the handicapped.

Our really true major mission element ties right in with first of all, our operations directorate, which when fully staffed, when we go into rail operation, will take in all of our rail operations, our bus operations, maintenance of both our bus equipment and our Metro-Mover, and also our railcars, as well as the basic planning and scheduling for operations.

In addition, it will be responsible for maintenance of all of our facilities engineering, to include track maintenance, signal maintenance, communications maintenance, and functions such as that.

Coming over now to the other major mission element is our engineering and construction department of 273 people, the department that exercises direct control over the construction of Metrorail. It has a contracts and claims section, a design section that reviews all designs that come in from the consultants, a system engineering section which concerns itself with the signal system, the communications system, and all of the systemwide requirements, elevators, escalators, and things of that nature.

Then, of course, there is our construction directorate, extremely important, with its inspectors, its chief inspectors, resident engineers, area engineers, and the head of it, Bill McDaniel, director of engineering and construction.

There are about 2,000 people in the transportation organization.

This will brief you on where you were this morning and where you will be going this afternoon. This is a scale map of the entire system. You started out at Dadeland South this morning, and then you traveled right up to Government Center.

[The following was received for the record:]

Okeechobee
Hialeah Park
Lehman Center
Northside
Dr. Martin Luther King Jr. Plaza
Brownsville
Earlington Heights
Allapattah
Santa Clara
Civic Center
Culmer
Overtown
Government Center
Brickell
Vizcaya
Coconut Grove
Douglas Rd.
University
South Miami
Dadeland North
Dadeland South
Rapid Transit Line
Rapid Transit Station

Mr. HIGGINS. Hopefully this afternoon we will get to travel by bus along the north end of the line bringing you up to Okeechobee. This is about a 21-mile rapid transit system with our yards and shops right out in the Okeechobee area. Our new facility of course has been named after Representative Bill Lehman. I hope you get to see that shop this afternoon. It is on 79 acres. It is an open-ended shop. It has the capability of maintaining well over 300 transit cars. It has built in the most modern of all kinds of maintenance equipment. I have seen probably most major shops in both this country and in Europe, and I think this is the finest shop that I have seen on any system. We have absolutely no alibi for not keeping our equipment in top shape.

A little bit about the people mover, a 1.9 mile square, and as you saw this morning when you were down at the Holiday Inn riding around into the Dupont Plaza area. This ring will permit people to get on at Government Center here and to get off practically at any block that they want to in the downtown area. In some cases, for example, the equipment will go right into the building. We are arranging for it to come right by the second level of the Burdine's store, so that the doors will open and you can walk right into the store.

The Metro-Mover is a very handsome car. I rode it in Pittsburgh 2 weeks ago. Of course it does not require an operator. It is a system that is extremely reliable. At the airport in Atlanta I understand they are achieving a fantastic reliability for it. It is going to be a great addition to our transportation system, and we in Miami will be the first city to have the pleasure of really integrating this kind of people mover system right into our heavy rail system.

The map shows the area from Dadeland South right up to Okeechobee, with the various areas of importance that we are going to serve. For example, right down through the downtown area stations will service directly all of the big hospital complex. In the Hialeah area it will service the racetrack. In the south Miami area it will service the university.

The phase we are working on now is to bring the line right out of Government Center, and then to swing northeast to Hialeah and Okeechobee.

Mr. STIERHEIM. The airport is in the back.

Mr. HIGGINS. We figure the airport is a very logical extension for our second phase, first of all because we have almost a captive ridership there, but second, if the bullet train does get off of the ground, coming down from Tampa, without a doubt it will tie in with our airport. It makes sense to have that intermodal terminal right at the airport.

I want to give a little bit of history to show you how long it can take to get one of these projects off of the ground. This project goes back to 1974–76 when Kaiser engineers were working on the preliminary engineering. It proceeded into final design in 1976 to 1979 with the Kaiser Transit Group. We started construction of the first small piece of the system in 1979. Real significant construction didn't start until about mid-1980.

I would like to break the project down to show you where the money goes. We mentioned this figure earlier, or the county man-

ager did, $986.9 million. You can see of that almost $1 billion figure, half of it goes right into construction, $505 million. Another big figure goes right into the real estate area, $109 million.

[The following was received for the record:]

No. 11

STAGE I METRORAIL SUMMARY
PROJECT BUDGET

DESCRIPTION	BUDGET TO COMPLETE
EQUIPMENT PROCUREMENT	$179,529,000
REAL ESTATE ACQUISITION & RELATED SERVICES	109,650,000
ENGINEERING & DESIGN	114,768,323
INSURANCE	15,000,000
CONSTRUCTION	505,295,863
STAFF SUPPORT OTHER SUPPORTING SERVICES	34,120,000
PRE-OPERATIONAL EXPENSES	5,872,000
CONTINGENCY	22,664,814
TOTAL PROJECT COST	$986,900,000

PROJECT FINANCING SUMMARY

FEDERAL	$688,252,264 (69.7%)
STATE	98,690,000 (10%)
LOCAL	199,957,736 (20.3%)
TOTAL PROJECT FINANCING	$986,900,000

Mr. HIGGINS. By bringing our rapid transit line right down Route 1 and right through some of the most precious property in Miami, we now enjoy the ownership of property of great value—property that will facilitate joint development as we get more into it, particularly in such areas as Douglas Road.

One point on equipment procurement which added complexities to the project. We opted for system-wide procurement early in the game. For example, I remember when I first started as deputy looking at a lighting contract, where we were procuring under one contract all of the lighting for the system. The lighting equipment was going to come into Dade County and there were hundreds and thousands of pieces. I don't know how you would ever warehouse it and keep it, but we were fortunate to get an amendment into our specs to require the contractor to store it, and we call it as we need it.

We also had system-wide procurement for our rail, which did save us money, and also for our escalators and elevators.

We like to show this chart. It makes Alan Kiepper in Houston a little upset each time we show it. We feel that when the money is broken down, whatever ratio that UMTA and the Congress decide upon, whether it is 75–25 or some other ratio, one of the factors that ought to be cranked into the formula is the cost per mile.

[The following was received for the record:]

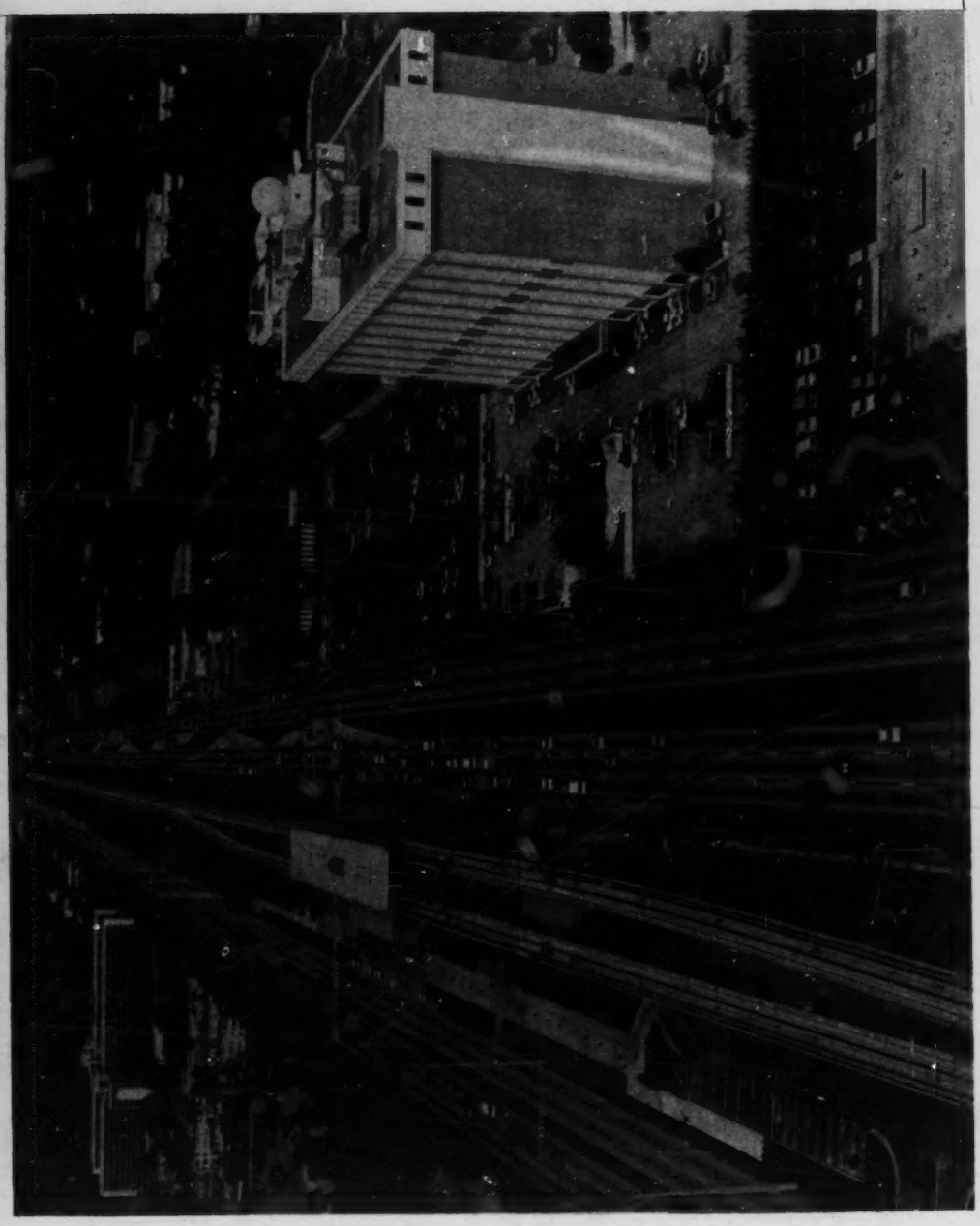
No. 12

NEW START
COST EFFECTIVENESS

PROPERTY	TOTAL COSTS	MILES	COST/MILE
ATLANTA(1)	1.2 BILLION	13.7	$ 88 MILLION
BALTIMORE(2)	800 MILLION	7	$114 MILLION
BUFFALO	542 MILLION	6.4	$ 85 MILLION
HOUSTON	2.1 BILLION	18.5	$114 MILLION
LOS ANGELES	3.1 BILLION	18	$172 MILLION
MIAMI(3)	987 MILLION	20.5	$ 48 MILLION

LEGEND:

(1) PHASE A ONLY
(2) PHASE A ONLY
(3) PHASE 1 ONLY



Mr. HIGGINS. In other words, if an area is able to, through simplicity, or through other ways, come up with a system that costs appreciably less per mile, it ought to benefit in the cost participation from the Government. At least we feel we should.

We have some comparisons here with Atlanta. We think this is a very conservative figure—about $88 million a mile. We have got Baltimore at $114 million, Houston $114 million, Los Angeles $172 million, which I think is a very conservative figure, and here in Miami, because of our system being completely elevated, because of our stations being very simple with no air-conditioning, very easy to maintain, very easy to police—a policeman can see from one end of the platform to the other—we are going to bring this system in under $50 million a mile.

We also believe that when we push out to the airport, even though the construction will be tougher, the lessons we have learned will still permit us to keep our costs around $50 million a mile.

Mr. LEVITAS. Would you go back to the budget projection. As of what date are those projections made?

Mr. HIGGINS. These figures?

Mr. LEVITAS. Yes.

Mr. HIGGINS. They are about a year old.

Mr. STIERHEIM. February 1982, I believe.

Mr. HIGGINS. Can I tell them this? We did give the county manager an update last week on these figures.

Mr. LEVITAS. And have they been changed any in that update?

Mr. HIGGINS. They have not been changed substantially. The one big change in them is for additional engineering and our reserve for claims. We have set up a reserve for claims for about $39 million. It is kind of difficult for us to know just how they will come in. We know that every contractor always comes in much higher than he ever expected to get in the final claim.

Mr. LEVITAS. So the $986,900,000 figure which was the early 1982 figure, is, except for the increase in the reserve for claims, essentially the same figure today?

Mr. HIGGINS. It is a reasonable figure.

Mr. LEVITAS. And when was the last revision prior to early 1982 made?

Mr. HIGGINS. In 1981, when I was designated as the transportation coordinator, the board directed me to make a complete evaluation of the cost. They said, "You are taking the job. Now here is your chance to take inventory of your money, what you need to build the system."

We did go through very thoroughly, even recosting all of our stations, and that is when we found out that we were short about $120 million, that we had to get $120 million more to build the system one way or another, or cut back.

Well, we went both ways. First we reviewed all of the stations, all of the areas where we felt we could cut back. Landscaping, for example, we had budgeted at $16 million. We cut it back to $10 million, figuring that if we were lucky later on downstream we could go back and put it back in again. We tried to cut pieces of the project that would not hurt us. We could always come back with it.

Mr. LEVITAS. When you started that process, Mr. Higgins, what was the base figure that you were starting from before you made your recalculation?

Mr. STIERHEIM. $867 million.

Mr. HIGGINS. $867 million.

Mr. STIERHEIM. That was set back in 1978.

Mr. HIGGINS. Two other things happened. The county commission voted a $24 million special obligation bond issue for us to put in our power; that was our biggest worry with Florida Power & Light; and then after taking another reading, the commission voted another $62 million, after we assured them that we could come up with savings that would bring us right into this $986.9 million figure.

Mr. LEVITAS. Fine. Now you can go back to where you were.

Mr. MOLINARI. If you will yield before we leave that chart.

Mr. LEVITAS. I will be happy to yield.

Mr. MOLINARI. Looking at the bottom of the chart, it shows that the Federal share remains constant, but the total has changed.

Mr. STIERHEIM. I spoke a little about this yesterday. We came in somewhere in midstream and had the full funding agreement for the Hialeah extension. That was back—there have been a couple of changes.

The county has actually picked up considerable additional cost. We picked up the $62 million figure that I mentioned in midtestimony on the adjusted overrun. We picked up the Florida Power & Light bond issue. That was another $24 million, and we have had and have pending grants with UMTA now for extraordinary costs, extraordinary impacts. The Haitian refugees that I mentioned increased our cost of right of way and delayed the acquisition of right of way.

Mr. MOLINARI. Could you do this for me then. Could you please give us, as current as possible, what the figures might be in those three columns at the bottom?

Mr. HIGGINS. I think that is accurate.

Mr. MOLINARI. I thought you said that February 1982 was the last time that you had an update.

Mr. STIERHEIM. That is Alan Wulkan, deputy to Mr. Higgins.

Mr. MOLINARI. Would you mind clearing up the confusion?

Mr. HIGGINS. This figure, $986.9 million, is the figure developed in 1982. These figures here totaling $986.9 million are the sum total project financing now. In other words, we have in here a contingency, so that is why you get your balance here. This is the amount of money, total amount of money, as of right now that we have got to spend on the project.

Mr. MOLINARI. Do you mean to suggest that you hit it right on the head?

Mr. HIGGINS. No, no.

Mr. MOLINARI. Then I am missing something.

Mr. HIGGINS. Probably it is the contingency in here that——

Mr. MOLINARI. $22 million of contingency.

Mr. HIGGINS. $35 million for claims spread through the individual projects.

Mr. LEVITAS. Mr. Stierheim, do you want to expand on that a little bit?

Mr. STIERHEIM. That is a firm figure. It may change as we go down slightly. For example, QA, quality assurance, that was never included in the original contract, and we have gone ahead and obligated ourselves.

We have got a large staff out there. We have hired all kinds of consulting engineers to run tests and so forth, so there are some modifications, and we will be in communication, but that is a figure that has held fairly firm.

We will be reporting to the transportation committee probably in January, updating and finalizing those figures.

Mr. MOLINARI. What I am trying to determine is that, to the best of your ability, the figures at the bottom represent——

Mr. STIERHEIM. A good——

Mr. MOLINARI. A fairly good ballpark figure as of today.

Mr. STIERHEIM. That is correct.

Mr. MOLINARI. Thank you.

Mr. HIGGINS. And the only change that could happen right now to those figures is, we have put into UMTA for various types of extraordinary costs to the tune of $40 million. We have received $20 million so far, and we feel we still have a good opportunity of getting another piece of the other $20 million.

Mr. SHAW. Would you yield on that point? I think I am on course until somebody adds something a little extra. The $20-some million or $40-some million that you just referred to—is that included in your total project financing, or is the actual total that figure plus $40 million?

Mr. HIGGINS. No, just the $20 million that we have received is included in here. We have not included—we would not until we receive it.

Mr. SHAW. That is your local figure. We are talking about UMTA; we are talking about the Federal figure.

Mr. HIGGINS. It would be in here.

Mr. SHAW. The $40 million that you are talking about is in that $688 million.

Mr. HIGGINS. No, it is not, only $20 million of it.

Mr. SHAW. So there is $40 million that is not included in the total project financing.

Mr. HIGGINS. No, there is $20 million. We have received $20 million of the $40 million.

Mr. SHAW. $20 million of the $40 million isn't $486 million.

Mr. HIGGINS. That is right.

Mr. SHAW. So then it is correct to say that there is another $20 million not included in your bottom figure which at this time you anticipate receiving.

Mr. HIGGINS. That is correct.

Mr. LEVITAS. Mr. Stierheim, you wanted to say something.

Mr. STIERHEIM. One more relevant point; your original funding formula was 80-10-10, and I think what this indicates is that we are under 70. The Federal share now is running 69.7 percent. We hope to increase that if the UMTA administrator will accommodate our request, but some of that comes through the full funding, and additional costs we have absorbed at the local level with some State assistance.

Mr. MOLINARI. How about the State?

Mr. STIERHEIM. The State has responded each time, has increased its participation now to the 12.5-percent level, not without some struggle on our part, I might add, but so far they have been with us.

Mr. MOLINARI. It is now 12.5 percent.

Mr. HIGGINS. Yes.

Mr. MOLINARI. Thank you.

Mr. HIGGINS. I would like to get down now to some of the real issues, and I suppose these are the types of issues that people have different views on. You can discuss and argue some of them back and forth, in some cases how I feel about it is because of what I have gone through in the last 4 years. The first one is the control of design.

Initially, of course, when you are building a transit project and you have been in design for an extended period of time, you are very, very anxious to build it, to get something out on the street, to let the people see what they are getting for their money. Sometimes that can hurt you, because you go out with a design package, say one station or one piece of a system, that isn't large enough to entice some of the real top builders to sharpen their pencils and bid on it.

We had that example with University Station. We wanted to get that out to show the public that Metrorail was starting, and we were building, and so we got the design out on University Station. We got one builder, and really not a very good builder; in fact we had to go to the bonding company on him, and it not only set us back, but it didn't accomplish what we really were trying to accomplish.

I met with several of the major contractors and asked them why they were not bidding Miami projects. Time after time we were not getting a good spread of bids, and the answer was quite simple: The package was not big enough to permit contractors to come to Dade County and mobilize and bring their cadre here and to make some money on the job. When we started to hold up design until we had two or three stations ready to go to the field with, when we did that, and we did it on three occasions, in each particular instance we got eight or nine bidders, the top companies, the Kiewits, the Perinis, and the bids came in $4 million or $5 million under our engineer's estimate each time.

So my feeling is, when you rush design right to get things out in the field, you lose out on good bids. It is better to have a long-range plan for your project.

One of the objectives this project had, and it was a good objective, and that was to break the construction project into small pieces, so that as many contractors, particularly local contractors, could receive a piece of the project and benefit from it. That is fine, but when you do that, you break it up into small pieces, you do lose some of the best professional contractors to do the work, and also you create a tremendously difficult construction management task, because you increase tremendously the number of contractors you have to manage.

Looking once more to the schematic of the line that you were on this morning, Dadeland South is right over here to the right, and

you can see the stations swing right around and end up with the Palmetto Yard way on the north end.

Now on all of these particular jobs, practically every station itself had a different designer, and that designer had three or four levels of subdesigners that designed with him. Further, until we started combining stations, practically every station had a separate contractor.

F. J. Rooney, for example, is the contractor on the Government Center Station. The Perini Corp. is a contractor on University. South Miami had L. G. Defelice; Hialeah had Peter Kiewit & Sons.

In retrospect, if I had construction managers looking at this with me now, the first thing they would do if we hadn't put out any contracts would be to say, what is the best way to break up this job? Probably they would come to the position of four to five sections with a major prime in each section. The major prime himself would get his subs. It would be much easier to manage; you would get a better bid, and you would surely get a topflight contractor to do each section.

The system we used did have its benefits, and in a little while I will show you our minority participation. I am sure the minority participation was helped by breaking up the job into smaller pieces.

Hopefully, you will see some girders being erected this afternoon on the north line. After stopping girder erection for a short period of time to do some checking on the hammerhead pier caps, we now have a go-ahead, and we are completing the erection of all of the girders on the north line.

We expect all girders to be in place by spring. We expect all track on the north line right out to be in place by June. That means by June the track on the whole system will be complete.

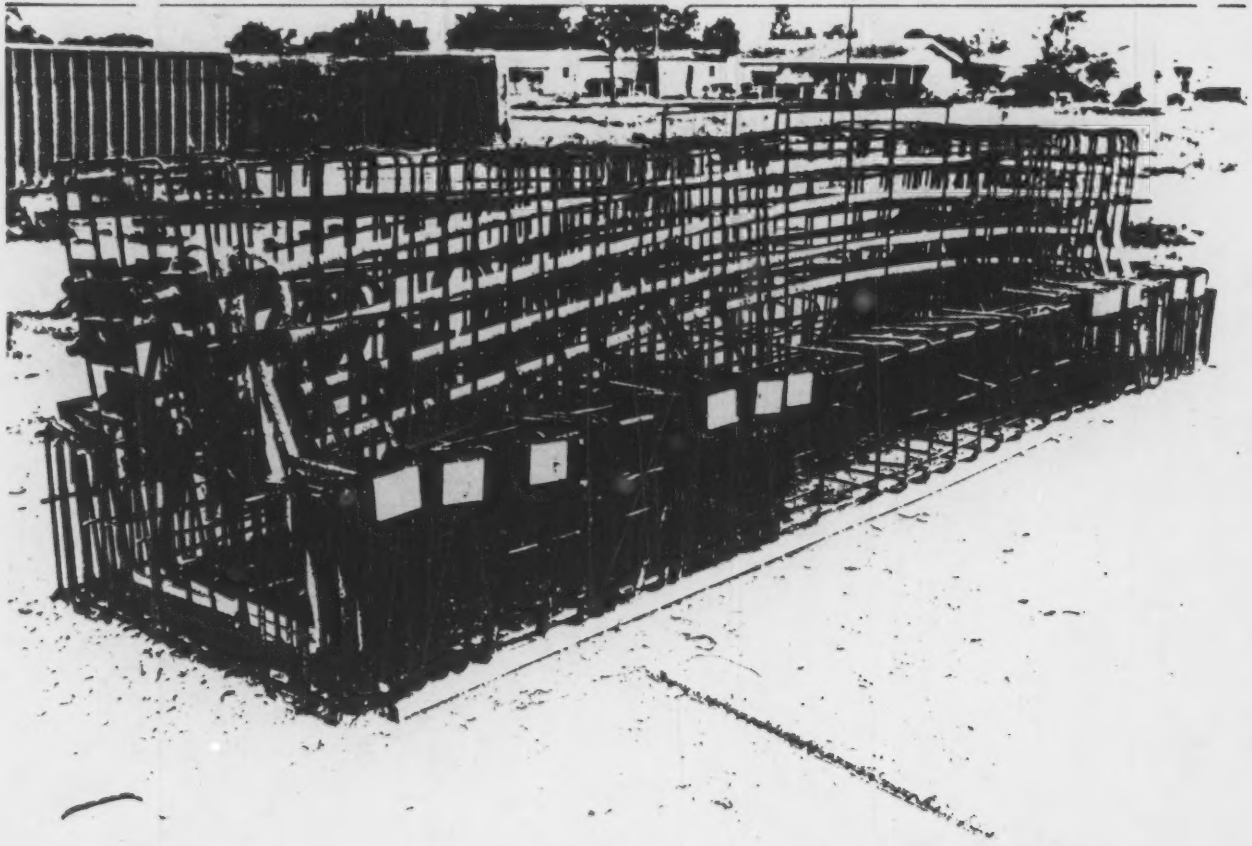
This chart is my favorite, but not really my favorite. This is the inside of a hammerhead pier. When you look at it, you wonder how in the name of God could anybody even add concrete to it, it has so much rebar in it.

In this unit there is close to 3,000 pounds of rebar. We are working with them, fixing them, and we are going to make them work, but it has been the most difficult thing that I personally have ever experienced in my life.

Another thing about it is that while they say this is standard, that is really not true. There were several versions where in particular situations one angle bar or another angle bar varied somewhat, so some of our engineers, chipping in, have to insure that they are looking at the right specifications for the right hammerhead pier cap.

[The following was received for the record:]

No. 15



Mr. HIGGINS. Also, this was supposed to be assembled on top of the pier itself It was very, very difficult for any group of young engineers or construction workers to get up there and assemble and tie these pier caps.

Finally, after a great deal of experimentation, a plan was come up with where they assembled them on the ground in two pieces and then brought them up to the pier top for further assembly.

Mr. LEVITAS. Have you ever seen a pier cap of that sort before?

Mr. HIGGINS. I have never seen one this complicated, with this much rebar in it. My first thought, of course——

Mr. LEVITAS. Are you aware of any that have that similar design in other places, other locations?

Mr. HIGGINS. I am not, and I did talk to Bill Alexander, who was the head of construction for MARTA when we were first looking into these to see what some solutions might be. This was quite a new thing to him.

The point I really want to make about this, and it is a simple point—we did part of it, but we didn't go far enough. That is, once you finish design of any system and you are satisfied with that design, the next stop ought to be, can you build it, can you construct it, and in order to make that determination, then some of your good designers ought to go through and pick out the complicated components of that system and subject them to a constructibility test. It will save money in the end if they do it.

We did it to the piers except the nonstandard piers, and it did help us a lot. I wish we had done it to this. We probably would have never built this if we had subjected it to a constructibility test.

Mr. MOLINARI. Could you elaborate on that for us, please?

Mr. HIGGINS. I think that after this was all designed, we put it out in the field with a group of men to build it, and to have them build it the way it was supposed to be built on the top of a pier, and having it tied off. They would say OK, this is much too complicated for any contractor, even with inspectors, to do properly. We have got to simplify it. Here are some of the things we ought to consider probably.

This has almost 3,000 pounds of steel in it. Maybe a steel cap would work. We have some of our girders of steel. You can't hardly tell the difference from the concrete. Or maybe we don't need bars that are running at angles. Maybe we can go for straight rebars that run either vertical or horizontal, or to look for ways that would give us the same strength but would make it easier to construct.

Mr. LEHMAN. Mr. Chairman.

Mr. LEVITAS. Mr. Lehman.

Mr. LEHMAN. I know that Warren and I have talked about this Rube Goldberg type of operation with those hammerhead piers. The constructibility of that design was almost self-defeating from the beginning, to some extent. It was so difficult a design to actually create in place, is that not what you have been saying, Mr. Higgins? That is more or less what you have been saying.

Mr. HIGGINS. Yes, it is. It is a year ago now when I had the concerns about the pier caps, and this was before the inspections and

so forth, and I directed KTG to start chipping into them, to start looking at them.

Mr. LEVITAS. Could I interrupt just a minute. When you first knew that this was going to be a very difficult project to construct with this hammerhead pier design, would it have been possible—you mentioned something in regard to MARTA in Atlanta—to benefit from the experience of other systems elsewhere in the country that did use hammerhead piers, or that used a simple design? Was there anyone out in California who you could have gone to before we got too far out of line with this particular type of construction so you didn't have to reinvent the wheel, so to speak?

Mr. HIGGINS. Mr. Congressman, we did have one brainstorm session after another with the best brains we could find, to first of all find out could we get away from the use of this type cap, and because this cap was married to the type of pier and the type of girder we were using, it was almost like an erector set philsophy. It had to relate to it, and it was just too late in the game to make major design changes to it.

Mr. LEVITAS. Let me just add one other thing. When you were studying all of these problems with this design, and the whole problem of hammerhead piers and pier caps goes back to this design as far as the reinforcing steel is concerned, when you had all these problems and you were getting all the best brains that you could get, were any of those best brains from UMTA?

Mr. HIGGINS. I think Gene Carroll sat in with us from the region, and I consider him one of the best brains in UMTA.

In fact, we called a peer review group of people in to look at it. The problem was, we were just too far down the road for any major modifications. But we were able to make some modifications in specific angle bars and specific pieces of rebar that permitted the construction to continue.

Mr. LEVITAS. Let me pick up on that question, because I think Congressman Lehman is pointing toward a very critical issue, and we will get into it later when we speak with the UMTA representatives here today.

You made the statement that if you had it to do over again from the beginning, you would have gone to a simpler type of construction in this regard. I am told this particular design was done by a computer to begin with, and with the complexity of it, you would almost have to had a computer just to keep track of it. And yet you are building onsite some 300 or more of these.

The question that I would ask is this, and it is not directed at just this project, because I can give you examples of others. Why wasn't that question asked earlier in this whole process, when the consulting engineer originally presented to somebody, the transit property or the people here in the county government, this design? Why wasn't that question asked earlier on?

Mr. HIGGINS. It is hard to know why it wasn't. For example, I asked why wasn't it challenged by the contractors who bid the job. They had the work drawings. They knew what they had to build. They didn't make any challenge to it at all, until they started to build it, and then they screamed like the devil.

Mr. MOLINARI. Would you yield?

Mr. LEVITAS. I will be happy to yield.

Mr. MOLINARI. When was this question first raised? When did anybody raise questions about this type of construction?

Mr. HIGGINS. It was first raised to my knowledge when clients came in from the contractor in the north—it was either Defelice or Wimpey—that they were experiencing extreme difficulties in building this particular pier cap. I would say that that was probably—oh, Bill McDaniel, could you guess when they first started?

Mr. MCDANIEL. I think we first recognized the problem in mid-1981. We knew it was going to be a significant time flow problem in 1981, but the complexity and how serious it really was emerged at the beginning of 1982.

Mr. STIERHEIM. That is Bill McDaniel, supervisor of construction.

Mr. LEVITAS. Mr. Higgins, you are the witness who is testifying. I didn't hear what was said. If you would just repeat that and provide us with the information.

Mr. HIGGINS. If I heard you right, Bill, the question first came up in mid-1981 when some contractors were experiencing difficulties with them, but they were getting along and weren't really screaming very much. But they were not getting any kind of production, and as it went on it became a more severe problem.

Mr. LEVITAS. Do you want to add something to that, Mr. Stierheim?

Mr. STIERHEIM. May I add something, Mr. Chairman. I don't want to leave this hammerhead pier thing. I am not a defender of the hammerhead pier. That to me as an administrator looks like a ball of spaghetti or something, but the county contracted for design. The reason for the hammerhead essentially is that it runs up, for example, 27th Avenue on a narrow medium, so you need a single column to support the girders. The fact is that, yes, it is difficult to construct, and it is complicated design that our consulting engineers now say there could be some changes.

For example, as Warren said, instead of having that 45-degree angular steel, it could be done vertically much simpler and easier to construct. That is an opinion, but you know just like doctors disagree, I don't want this committee to walk out of here and feel that those hammerhead piers are not going to do the job they were designed to do. They are passing the tests, the load tests and so forth, more than passing them, exceeding them. We are running another test this week on the ends—I am beginning to sound like an engineer—where you tie into the tensioning system. We may wind up in a claims situation, where the contractor is claiming delays, and he is claiming against the architect engineer.

The county sits here having contracted with five or six of the top engineering firms in this country who came together under the Kaiser Transit Group. We asked them to design a system that would meet all codes and UMTA requirements and everything else, and they did that. We put it out to bid. Some of the biggest contractors in the country, really in the world, came in and they bid it with competent structural engineers and so forth. So we are in an area that I am sure will be arbitrated or may be litigated down the road, and I am not a champion of the hammerhead pier. It has caused me a lot of grief because of the tests and the accusations and everything that have gone on in the past, but please rest assured that we are not going to open that system to the public until

these tests are complete, and we are 100 percent certain that all of the design criteria, the derailment impact load and everything, is going to more than do the job.

Mr. LEVITAS. Mr. Stierheim, let me say this, and I am going to get into this a little bit later on. Our questions on this point I don't think are directed to the safety or reliability aspects of the hammerhead pier.

Mr. STIERHEIM. Good.

Mr. LEVITAS. There are questions as to increased downtime should there be a failure and to the cost of this complexity. What Congressman Lehman, Mr. Molinari, and I are getting at at this point is, did the complexity of design in this instance result in either a more costly or time-consuming or difficult construction operation, and if so, what lessons are to be learned.

You know this isn't the first time.

Mr. STIERHEIM. Yes.

Mr. LEVITAS. The M-1 tank was designed in a way that makes it probably one of the greatest fighting vehicles in the world, but you almost have to be an engineering graduate to run a tank these days. We have come into a period of time where we have abandoned the use of Aiken's principle, Aiken's razor.

I was taught when you have two or more solutions to a particular problem, you adopt the simplest of them. We seem to have repealed Aiken's law, and now, whether it is an M-1 tank or a hammerhead pier cap, accept the most complicated solution. I think that is the thrust of the questions at this point.

Congressman Nowak.

Mr. NOWAK. Mr. Chairman, if I may, on page 12 of Mr. Higgins' submitted testimony he talks about the problems that they have had with the design, and their suggestion, I think, is contained in the second paragraph where he states, "The result is an exceptionally difficult reinforcing placement problem that probably could have been avoided, as I mentioned above, by preconstruction constructability and design review."

What you are saying, you are repeating it, if that had been done, you would have avoided perhaps this whole problem by not selecting that design.

Mr. HIGGINS. Exactly right.

Mr. NOWAK. Is that correct.

Mr. HIGGINS. We did it for the girders. We should have done it for the pier cap, in my opinion.

Mr. NOWAK. I think that is a lesson for this committee, that on these projects to be considered in the future, everyone, UMTA included, should look at any particular design problems that are anticipated, and spend the time and the dollars necessary to avoid the bigger problem through this constructibility and design review. Isn't that your recommendation very strongly to the committee for all projects in the future?

Mr. HIGGINS. You are saying it much better than I did. That is exactly it.

Mr. LEVITAS. And let me say this, to followup on what Congressman Nowak has said. Again the problem doesn't start with the hammerhead pier. This subcommittee has for years been concerned about excessive technology. We issued a report in March 1980 on

the Urban Mass Transportation Administration's technology development and equipment procurement programs and talked about the transbus and some other new technology. At that time, observations were made to the effect that the UMTA program obviously had been hampered by developmental excesses and efforts to force technology. One of the recommendations is this: "There has been an admitted fascination at both the Federal and the local levels with sophisticated technology that represent huge front-end investments and equally high day-to-day operating costs. This must change."

We are talking about rolling stock in this instance, but the problem is the same. There seems to be this fascination with the repeal of Aiken's razor, if you would.

Mr. MOLINARI. Before we leave that, Mr. Chairman, one thing that we haven't talked about, and I think this is the appropriate time to do so, relates to the cost of construction. Was this designed to reduce the costs, or is it just the opposite? Did it increase your cost? Can you give me some idea?

Mr. HIGGINS. I am guessing. You see, that is a hammerhead pier cap that was designed by our general consultant.

Mr. MOLINARI. KTG?

Mr. HIGGINS. KTG, and I am sure if someone came up here beside me today, they would try to defend that design as being the tough type design that is needed to handle a derailment load, and things like that. I don't personally feel that way, and quite a few of the staff I work with don't feel that way, but as far as the cost to build it, I am afraid that the contract bidders did not recognize the complexity when they bid, and now they are coming in for claims because it took them more man-hours than they thought to build it. These are claims that we will be negotiating with them in the future.

Mrs. OESTERLE. That is their fault.

Mr. MOLINARI. I don't want to prejudice your position in any negotiations or lawsuit, but again I have in my own head a question as to whether this was designed to reduce costs or whether in fact it was much more costly than other alternatives.

Mr. HIGGINS. I would have to say that KTG who designed it, the individuals who designed it, thought they were designing the best hammerhead pier cap to meet the hurricane loads and all of the other requirement factors that we have in this area. I am saying that that is fine, but why the heck didn't they test it to see if it could be built in a reasonable manner.

Mr. LEVITAS. Dr. Rowland.

Mr. MOLINARI. You still didn't answer my question on costs.

Mr. HIGGINS. I don't have the answer, I am sorry. I know that we will get claims from the contractor at the end of the contract, because of the complexity of constructing. We have been able to give him some help by modifying distances between rebars and small things like that that allowed his people to get their hand in there and to make the ties and things like that, but nevertheless it is an expensive piece of equipment.

I would like to, if I could, mention——

Mr. LEVITAS. Congresman Rowland has asked for recognition.

Dr. Rowland.

Dr. ROWLAND. I believe it was asked earlier, how much UMTA was involved in making decisions about this earlier. You mentioned one person who was involved, but I don't believe that I heard anyone else mentioned. In building projects around the country, you must have learned that one place is not necessary helpful to another place unless there is some medium to get that information there, and I guess, Mr. Chairman, what I am saying is that maybe UMTA ought to be involved more in decisions such as this, so that you could benefit from the experience that other areas have had.

Mr. LEVITAS. I think that is going to be one of the areas that we will clearly be covering with the UMTA witnesses today, that very situation.

Let me say that, without objection, Mr. Higgins, your entire prepared testimony will be made part of the record.

[The statement of Warren J. Higgins follows:]

TESTIMONY OF WARREN J. HIGGINS, EXECUTIVE DIRECTOR, METRO DADE TRANSPORTATION ADMINISTRATION

I. INTRODUCTION AND MDTA EXPERIENCE

My name is Warren J. Higgins, executive director of Metro-Dade County Transportation. I was confirmed in the post at the October 6, 1981, meeting of the Metro-Dade Board of County Commissioners, based on the recommendation of the County Manager.

Prior to my appointment as executive director, I was Deputy Transportation Coordinator for almost two years. Subsequent to the Departure of Dr. John Dyer, I became the second Dade County Transportation Coordinator. Through the years, my duties have included overseeing the operation of Dade County's overall transportation improvement program which includes over 600 metrobuses; construction of metrorail, our 21-mile, elevated rapid transit system; final design and construction of the 1.9 mile downtown people mover called Metromover; the operation of the special transportation services for the handicapped; and regulation of the taxicab system.

I have almost 20 years of direct experience in rapid transit and bus transportation systems. While in Boston, I was directly responsible for implementing the authority's $2-billion capital expansion and modernization program which included rapid transit, streetcars, light-rail vehicles, trackless trolleys, and a commuter railroad service for the 79 cities and towns that compose the greater Boston area. The annual construction budget there was $200 million.

As Director of Operations for the Massachusetts Bay Transportation Authority I was responsible for administering an annual operating budget of over $250 million. These funds were used for manpower, vehicles, schedules, power facilities, and maintenance departments for the authority.

I have an extensive military background, which further prepared me for managing an operation as large as Dade County's transportation program. I was the Army material readiness officer for the U.S. Army Pacific and also served as chief of organization, programs and analysis for the U.S. Army Pacific Logistics Command. I also served as the executive officer to Major General Adams who headed up the logistics command.

My duties in the military also included transportation-related activities. I was the senior executive officer to the Army Chief of Transportation in Washington, D.C. I served in that capacity for three consecutive Army chiefs of transportation, who managed the world's largest transportation system.

DESCRIPTION OF DADE COUNTY TRANSIT

The Metropolitan Dade County Transportation Administration oversees four transportation areas: Metrorail, Metrobus, Metromover and the paratransit services, and is currently involved in special joint development efforts with the private sector for development of station areas.

METRORAIL

Dade County's Rapid Transit System, called Metrorail, is 21 miles long and extends south to north from the semi-suburban Dadeland/Kendall area through downtown Miami, the civic center/Jackson Memorial Hospital complex, the model cities area, to the city of Hialeah and the Hialeah racetrack. The route culminates at Okeechobee Station.

There are 20 stations along the route spaced approximately one mile apart. The guideway is elevated, generally about 16½ feet above the ground. At the Miami River, however the guideway exceeds 75 feet in height.

The stainless steel vehicles being manufactured by the Budd Co. of Philadelphia, seat 74 persons with room to accommodate handicapped persons and stanchions for standees during rush hour periods. They are coupled in married pairs, have steel wheels and run on continuously welded steel rails, which significantly reduce noise impact.

The initial order from the Budd Co. was for 136 vehicles in conjunction with the Maryland Transportation Authority for its Baltimore Rapid Transit System, which entails a cost savings of about $50,000 for each train. Each vehicle has a cost of approximately $825,000.

The entire system is electrically powered and computer controlled.

The design of the stations emphasizes safety security and simplicity in maintenance. Each station contains basic similarities such as location of elevators, restrooms, and access and egress routes to aid physically or visually handicapped patrons.

The trains will operate in lengths of two, four or six cars each. At full capacity, a metrorail train can carry more than 1,000 passengers into downtown Miami from either Okeechobee or Dadeland South, the two terminus stations, in 20 minutes, including all the stops along the way.

METROBUS

Metrobus is the bus operations branch of MDTA which carries an average of 213,000 passengers per day. Last fiscal year, almost 63 million passengers used metrobus. There are 622 buses operating routes, a total of almost 73,000 miles every weekday for the fleet. Total miles operated in fiscal year 81–82 were approximately 25 million. There are three main operating divisions: Coral Way, a facility just built two years ago; North Division which was completely refurbished and expanded this year, and the main or central division facility, currently undergoing expansion and renovation work, to be completed sometime next year.

The average daily farebox revenue is $84,000. Total farebox revenue for last fiscal year was close to $31 million. Passengers paid for approximately 41% of total operating costs. Miscellaneous revenue brought in over $1.3 million last fiscal year. Total operating expenses last fiscal year were $74,665,000.

METROMOVER

In 1976, the Federal Government sought to initiate peoplemover projects, and 64 cities and counties expressed serious interest in the program. Among them was Metro-Dade County. In 1982, Miami became the first city to begin peoplemover construction. The Dade County Commission created the downtown peoplemover policy committee in 1979 to select what was to become the DPM alignment. Preliminary engineering was completed in 1980 and in April 1981, a contract for the final design and construction of the system was awarded to Westinghouse Electric Corporation. Westinghouse has provided peoplemover systems for airport terminals and theme parks throughout the world. However, Dade County's will be the first in the Nation to be coordinated with a rail and bus system. Groundbreaking for stage I of Metromover took place on August 31, 1982.

Metromover will consist of 1.9 miles of elevated light rail facilitating the movement of people around the downtown Miami business district, from the World Trade Center to Government Center, and from there to the New World Campus of Miami-Dade Community College, to Bayfront Park and to the Miami Center. Connections with Metrorail and Metrobus will be made at the Metrorail Government Center Station.

PARATRANSIT SERVICES

Paratransit is the term used to describe those modes of transportation that fall between fixed-route transit, such as Metrobus, Metrorail or Metromover, and the private passenger automobile. It includes carpools, rental cars, taxicabs, jitneys and

limousines as well as related services like dial-a-ride and specialized commuter services.

Major current projects include: implementation of taxicab improvements at Miami International Airport, start up of the Coordinated Social Service Transportation System, finalization of the catch-a-bus project, a provision of feeder service in selected areas to regular Metrobus routes by private paratransit operators; and policy review of major regulatory concepts of the taxicab ordinance.

JOINT DEVELOPMENT PROJECTS

To further utilize Metrorail station sites, joint development projects were begun in 1983. The first Metrorail joint development will be with the green companies, a private construction/office management firm for the Dadeland South Station. This project comprises over $100 million investment. A second Green Company project, a $200 million development is planned for the Dadeland North Station. These developments entail the construction of shops, apartment buildings, hotels, office space, restaurants and parking garages built in exchange for air and ground rights. In its turn, Metro-Dade receives the use of parking spaces for the exclusive use of metrorail patrons as well as a percentage of sales and rental fees. Similar projects are in the preliminary stages for several other Metrorail station sites.

METRORAIL CHRONOLOGY

In 1964, the Miami Urban Area Transportation Study [MUATS] began with a feasibility study on transit for Dade County. As population soared and the 1970's began MUATS recommended that a rapid transit system be built. After extensive public hearings and community meetings, in 1972, the voters of Dade County approved a $132.5 million decade of progress bond issue to provide the local share of construction costs of the rapid transit system plus an expanded bus service needed to support the system. The Office of Transportation Administration MDTA's predecessor organization was founded in 1983 under Dr. John A. Dyer.

In 1976, preliminary engineering for Metrorail was completed. The U.S. Department of Transportation made a commitment in principle to participate in the construction of stage I rapid transit system by paying 80% of the costs.

In 1977, as population reached 1,400,000, persons UMTA committed $575 million to cover what was its anticipated 80% share of costs for a section running from Dadeland South to NW 67 Street. UMTA also authorized final engineering of an additional four-mile segment to Hialeah. The State and the county agreed to split the cost of the remaining 20% funding not covered by UMTA.

In 1978, the citizens of Dade County reaffirmed their desire for balanced transportation by voting down a referendum to repeal the bonds approved in 1972. In 1978, the County Commission approved a transportation master plan for the year 2000, which includes eventual extensions of the rapid transit system to the Broward County line and then west past the airport.

In June 1979, groundbreaking for the stage I system was held at the site of the University Metrorail Station.

In August 1982, groundbreaking for Metromover took place on the site of its future maintenance building.

PROJECT FINANCING

In May 1970, metropolitan Dade County entered into an $867 million full funding contract for metrorail with the Urban Mass Transportation Administration. The Federal share of $670 million represented 77.3% of the total project cost. The State of Florida (9.7 percent) and Dade County (13 percent) share the local costs of the project. A reestimate of the Metrorail project in September 1981 projected that due to extraordinary costs anticipated in the full funding contract, higher than anticipated inflation and real estate costs, and changes to the scope of the project, the cost of complete metrorail would be $986.9 million. The increase represented less then a ten percent increase to the original project cost with anticipated extraordinary costs.

In response to this cost increase and consistent with our full funding contract with UMTA, MDTA and the Board of County Commissioners took three bold and innovative steps to provide additional funding. First, to fund a change in scope for our electrical power needs, the board approved a $24 million industrial revenue bond issue backed by revenues derived by the county from the sale of the additional electrical facilities back to FPL. Second, $63 million in special revenue bonds, supported by a portion of increased sales tax revenues, was passed by the board. Final-

ly, MDTA reviewed all remaining contracts in order to take advantage of cost savings wherever possible. These three actions, plus additional matching funds from the State of Florida, provided funding which guaranteed the Metrorail project would be completed.

Metrorail represents one of the most cost effective decisions ever made by the Urban Mass Transportation Administration. With a cost per mile of under $50 million Metrorail's cost are less than half other major heavy rail systems currently under construction. The cost effectiveness of the system is attributed to decisions made early in the planning for the system. Metrorail is primarily elevated and has utilized existing right-of-way where ever possible. In addition design was closely monitored to insure an aesthetically pleasing yet low cost approach to construction. UMTA should encourage cost effective local decision-making by requiring premium-funding where local decisions, such as tunneling, over design or the alternative analysis process determines an alignment is not justified. However, where cities make cost-effective decisions they should have a reasonable expectation for 75/25 funding from UMTA.

RECOMMENDATIONS REGARDING RAIL SYSTEM DEVELOPMENT

At the start of this project to get things moving, contracts were put out for bid prior to complete design approval. Not enough time was permitted for constructability review which resulted in a high instance of change order work to correct design deficiencies or overlooked construction problems. A constructability review would have discovered these problems. Additionally, to encourage local contractor participation, line section construction was broken into several pieces. Which were then constructed independently. This reduction in the size of the contracts was meant to encourage local participation but actually did not produce the hoped for results. Instead many big contractors who had experience in this type of work in other parts of the country were discouraged from participating in the bid process. This practice of purposely bidding small contracts increased the number of interfaces required between construction contractors, with a resultant increase in potential for delay claims. Further, it increased the number of resident engineers, inspectors, contract administrators and the volume documentation and routine paperwork required to support each contract of lesser size (value).

In addition to the above, the guideway girders fabrication and erection was broken into 3 independent contracts and awarded to 2 contractors. Thus, the girder contractors and the line section contractors were continually encountering interface and delay problems. For future projects of this type, guideway and guideway support contracts should be awarded together and to as few contractors as is feasible.

Proven technology and construction techniques should be used rather than breaking new ground with its inherent potential for the unknown.

SPECIFIC RECOMMENDATIONS

As regards station contracts, I recommend reducing the number of independent contracts/contractors, and packaging several line sections under a single contract. This would offer more effective control and certainly reduce interface problems. Included with this should be certain system material installations such as cableway being installed by the trackwork contractor. Whenever feasible, and with the exception of train control and communications equipment, systemwide contracts should be packaged as furnished only and the installation of the equipment should be included in the station or line section contract. This assures the prime contractor control of the project without a massive interface problem found when 5 or 6 different contractors are involved.

As an independent quality assurance/quality control function, staff with personnel who have the required expertise should report directly to the executive director.

Sufficient qualified, experienced personnel should be selected and they have have the tools and equipment (vehicles, radio, test equipment, etc. . . .) required to effectively monitor the construction program.

Consideration should be given to packaging the construction of the traction power substation [TPSS] buildings under an independent contract. At a minimum package the TPSS construction in such a manner as to reduce the problems presently encountered by having them included in the station contract as was done here.

PIER CAP CONSTRUCTABILITY

The architectural considerations that imposed a depth limitation on the pier caps, increased the difficulty of the structural design of the pier caps and ledges consider-

ably, and made the pier cap reinforcing more complex, more congested and more difficult to construct. If the bottom of the pier cap could have extended below the bottom of the girder stem the design and construction of the pier caps would have been much simplified.

Constructability of the pier caps was significantly hampered by the selection of diagonal ledge reinforcing. For this steel to provide maximum effectiveness the angle of the bars, depth, and lateral location must be closely controlled. These dimensions are frequently governed by interferences with longitudinal pier cap post tensioning, shear key pockets, horizontal ledge plate assemblies, and post tensioning anchor plates. The result is an exceptionally difficult reinforcing placement problem that probably could have been avoided as I mentioned above, by a preconstruction constructability and design review.

Suggestions for avoiding these problems in future construction include: more reliance on standard elements that are truly standard; a preconstruction design review including constructability evaluation to the extent that a truly standard prototype cap be developed, built, and tested to optimize the design; diagonal bars which are difficult to hold and position should be avoided; contract drawings should be drawn as coordinated shop drawings in which all bars (both mild steel and post-tensioning) at actual bar widths, and bar bends are shown.

GIRDER PRODUCTION

Many difficulties surround the constructability aspects of the non-standard girders. Most deal with the method of forming and specific forming and reinforcing details required by the project requirements.

It would be ideal to create a pier layout to eliminate the need for non-standard girders. Although this is probably impractical, designs could be developed wherein a girder of a certain design could function for span differences of several inches to several feet. Then a small group or groups of girders could be made as standard girders and the pier caps could be non-standard since they are cast-in-place.

Another way to accomplish the elimination of the non-standard girder is to change the forming system to accommodate removable sections that would allow the distance between special end form units to be varied.

If the non-standard girder, utilizing a second pour cannot be avoided, then the attachment of the end diaphragm to the girder stem should be re-evaluated.

The project specifications for quality assurance must be rigorously enforced. Of great importance is an integration among the contractors quality control procedures. The overall program of girder quality assurance would be enhanced by a thorough review and reorganization by the designer of the significant items on which control requires assurance.

I recommend that separate brief checklists be developed by the designer for items important to construction with an emphasis on the tolerance allowed.

At the beginning of each major production type, a detailed involvement by the quality assurance personnel should be undertaken. The purpose of this increased involvement is to verify that the contractor system is working and that the assurance function is also working. The periodic use of thorough spot check audits also should be conducted on an unannounced basis.

An essential feature of the QA program is the development and use of some form of non-compliance reporting and necessary follow-up. The designer should be required to provide a review of the item. In this regard, it is strongly recommended that only written directives be given to the contractor.

CONSTRUCTION MANAGEMENT

In the summer of 1981, the Metro-Dade Transportation Administration assumed the construction management responsibilities from the Kaiser Transit Group. This action was taken for the following four reasons:

(1) Construction management activities at this period of time were moving too slowly. It was in my judgment due to design not being complete. In order to reduce KTG's responsibilities, so they could concentrate on completing design and review of shop drawings, I directed MDTA to assume construction management.

(2) It has always been my opinion that the firm who is responsible for design and engineering should not be responsible for construction management. The tendency to have corrections to design errors made under the pretense of construction errors is too great. A clear separation of responsibility with an independent construction management group is essential.

(3) Where staff exist, as such was the case in Dade County when we assumed construction management responsibility, the property itself should perform these activi-

ties. First it provides the property with continuity as construction is complete and operations commence. A strong cadre of people can be developed who will stay with the system, to maintain the structures they were responsible for building. Second, I believe it is more cost-effective to have your own people doing construction management, rather than paying construction fees, especially when you are involved in an ongoing construction program as we are in Dade County.

(4) Where staff does not exist, or the property will be doing only one project I believe a consultant not involved with design at any level should be retained.

MINORITY BUSINESS ENTERPRISE UTILIZATION

MDTA is focusing the assistance to disadvantaged business enterprises in its MBE program to areas that have been identified, through MDTA's experience, as major barriers preventing minority firms from bidding and successfully completing contracts.

These areas are: start-up capital, bonding line, cash flow, settlement of disputes between minority contractors and the prime contractors, and managerial capacity.

Addressing the needs of MBE in obtaining bonding and start-up capital, the BCC, on October 6, 1981, authorized the use of up to $10,000,000 of interest earned on unified transportation system bond proceeds in support of a minority business enterprise bonding program. The implementation of the program is accomplished through two vehicles: A consultant services agreement with Contractor's Training and Development, Inc., and a banking agreement with Capital Bank, where the bank acts as a depository of the county's ten million. Among other services, Contractor's Training and Development processes all performance and payment bond guarantee applications and submits the bond package to the surety company.

The bank also provides joint bank account services for the bond program participant and CTD. In addition, in consideration of the special account established, the bank provides an uncollaterized revolving working capital fund of $100,000 for bond program participants.

As of October, 1983, CTD has processed approximately $5,500,000 of performance and payment bond guarantee. In addition, capital bank has issued approximately $935,000 in working capital loans for the bond program participants. In great part due to this program we have been able to award over $137 million in contracts to MBE firms. This is over 21% of all work awarded by MDTA.

One of the first procurement contracts executed by MDTA was the joint vehicle procurement entered into with the Budd Company in 1979 by Dade County and the State of Maryland for Baltimore's rapid transit system.

Although the hope was that by ordering the vehicles four years in advance we would not experience the car delivery and break in problems such as Boston, Atlanta, and others have, this did not turn out to be the case. Instead of the 136 cars which were to be delivered last April we currently have twenty. This Nation must take steps to recapture the rail car manufacturing capability we once had. A long term commitment to new rapid programs and refurbishing and replacing old transit equipment will go a long way to encouraging American manufactures to once again produce rapid transit equipment. Otherwise I believe American cities will be purchasing foreign made equipment exclusively in the future.

UMTA ISSUES

Construction management.—The debate as to whether the Federal Highway Administration's system of construction management, with a very proactive role is better than UMTA's self certification process has been going on for years. In my judgement UMTA's role should be the following:

(1) To continue project management meetings as we have from 1980. However, in addition to reviewing our procedures and requiring self certification, UMTA should have a local office staffed with engineering professionals with backgrounds in heavy construction projects. These people should be responsible for reporting to UMTA on construction progress. However, as long as a full-funding contract places financial responsibility for completion of the project at the local level, direct construction management should stay with the grantee.

(2) Special consultant expertise should be available to UMTA for special analysis of construction issues. However, the role of this consultant should be to verify local decision-making. Where disagreements exist, and they ultimately will, certification at the local level for taking the responsibility of whatever action is necessary should be required by UMTA.

(3) We have seen no evidence that suggests construction projects with very active Federal involvement are better managed, cheaper to complete or avoid construction

related problems. To the contrary, we believe the closer to the local level accountability is delegated the better. The Federal role should be one of oversight, assuring that what we say at the local level we are going to do, is done.

(4) UMTA should require greater emphasis on quality assurance. These projects are complex projects, much more so than the construction of a highway. Interfaces are critical to systems safety which requires greater emphasis on quality assurance. Although quality assurance has always been part of our program we have strengthened this area, as described previously by the County Manager. All future UMTA funded construction projects over $100 million should have this type of strengthened quality assurance program.

CONCLUSION

I hope you enjoy your brief stay in Dade County. I'm sure you will be impressed with the design, construction and operation of our system. We have an excellent system which is safe, attractive, and well built. There are lessons to be learned from our experience. They are not new lessons as other projects have experienced similar problems. Each city must be examined as to its political, institutional, and administrative framework. The Federal Government should provide the flexibility required for this Nation's local governments to keep projects moving in the development of our public system. I hope you have found this testimony helpful to your most important efforts.

Thank you.

Mr. LEVITAS. Let me ask one followup question on the point that Congressman Molinari was pursuing.

When you became aware of the complexity proposed by this particular design, it was after that, as I understand it, that Metro Dade Transit took over the construction management of the project from the consulting engineer. It seems at that time, looking at it benignly, it was a courageous act for you to do that, particularly in light of what you have found.

Mr. HIGGINS. My recollection is that we took over construction management long before I ever knew I was going to have a problem with a hammerhead pier cap.

Mr. LEVITAS. Thank you. You wanted to——

Mr. HIGGINS. I wanted to make one more statement to emphasize that after we had the series of meetings in 1982, toward the end of 1982, and realized the complexity of this, we did start, ourselves, on our own, a major program to chip into all of the hammerhead pier caps that had been constructed. We did this before any Inspector General inspection or anything else. We also set up a team of competent engineers that were required to inspect every cage before concrete was poured, and also to take photographs so that we would know where the steel was located.

I would say my last point on it is that everything in the project that I have been connected with, this is the one issue that has been the most difficult.

Mr. LEVITAS. Yes, Mrs. Oesterle.

Mrs. OESTERLE. Mr. Chairman, I just want to reiterate one thing because of the claims that are going to be coming at us later, and as the holder of the taxpayers' moneys. When this hammerhead pier construction was designed, surely it was a complicated design, but we must take into consideration that the contractor who bid that had very competent engineers, and that contractor, if he had any doubts at all, should have tried constructing one of these before bidding on it. I want that in the record also.

Mr. LEVITAS. It is in the record, and in my former life I was a lawyer. I can see why you would want to put that in the record.

Mrs. OESTERLE. Thank you.

Mr. LEVITAS. Are you completed, Mr. Higgins?

Mr. HIGGINS. In about 5 more minutes, Mr. Chairman.

I would like to quickly show you a chart that we are quite proud of, that is, participation of minorities in this project.

[The following was received for the record:]

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION-CONTRACT COMMITMENTS IN RAIL, BUS FACILITIES & DCM

(CUMMULATIVE TO NOV. 1983)

No. 16

	AWARD AMOUNT	DBE COMMITMENTS	%
RAIL			
CONSTRUCTION & PROCUREMENT	$465,964,321(1)	$ 95,086,001	20%
ARCHITECTURAL & ENGINEERING (DESIGN)	30,925,212	8,138,830	26%
BUS FACILITIES			
CONSTRUCTION	$ 39,917,508	$ 20,752,441	52%
ARCHITECTURAL & ENGINEERING (DESIGN)	1,462,000	116,000	8%
DOWNTOWN COMPONENT OF METRORAIL			
CONSTRUCTION	$35,302,525	$ 11,333,674	32%
ARCHITECTURAL & ENGINEERING	76,487,654	1,865,924	2%
TOTAL	$650,059,220	$137,292,870	21%

(1) DOES NOT INCLUDE THE RAIL CAR, Y-911 CONTRACT

Mr. HIGGINS. This is almost a $1 billion project, and the bottom line is that minorities have shared $137 million or 14 percent of the project. In fact, they have shared more than our own decade of progress of around $132 million.

I would like to close with a few comments on another very controversial issue; that is, who should do construction management; and there are many, many schools of thought on it.

When we started here, we had a general consultant, KTG, who had everything. He had a lot of the planning, all of the design, all of the review of shop drawings, all of the construction management, costing projects, estimating of claims, practically the whole bailiwick.

When we started to get into construction in the mid-1980's and 1981, we began to run into serious problems in that the construction jobs weren't moving, and both John Dyer, who was transportation coordinator at that time, and myself had contractors pounding on our door. "Why can't we get our shop drawings back? The contract says they are due in 30 days, and yet some of them have run 100 days or more than 100 days." And of course the threat of claims over delays and things like that.

Well, after looking at the whole package and realizing that we really didn't have good control with the consultant who did the designs also managing and supervising the construction, and since during that period of time we had gradually built up a strong construction department ourselves, and since many of the same men that would be monitoring such things as the small system, the communications, things like that, would be the very men we would need to head up new departments, we felt it made a lot of sense for us to start gradually taking over construction ourselves.

We didn't want the designer to have the opportunity, for example, to use shop drawings as a way to redesign the project, and the contractors were complaining that that was happening.

Contractors were saying we were bidding on one thing and now when we get the shop drawings back, and we are seeing something else to build. We think that there are several ways that you can go about this, but it is obvious that the agency that does the design itself should not be the agency that does the construction management. We are not saying that the client or the owner has to do it; maybe a consultant is another way to do it. That is certainly a very acceptable way.

Mr. LEVITAS. Thank you very much.

Congressman Lehman.

Mr. LEHMAN. We have focused mainly on the hammerhead piers and the cost system, but on page 13 you mentioned the girders. I would like now at this time, if you could, to reassure us that the girders themselves present no problem, that the girders themselves are not a problem at this time.

There have been some questions raised in regards to the manufacture of these girders, of the lack of supervision in the manufacture of these girders. No matter how strong the support system is, in the piers or the hammerhead pier caps, if the girders themselves are not well made, you still have a system that is not up to standard.

Mr. HIGGINS. May I answer it, Mr. Chairman?

Mr. LEVITAS. Yes.

Mr. HIGGINS. We had Raths, Raths & Johnson, Mr. Chuck Guedelhoefer, come in and actually go out to the girder yard and conduct a series of tests on girders where we felt there was any problem, where the manufacturer was not in full accord with the specifications. This went on over an extensive period of time, and it was an extremely thorough test, and again the girders came out as having strength well beyond the specifications.

Now in one instance where a nonstandard girder was missing steel, it still tested out beyond its specified strength, but we said the heck with it, we are going to put the steel in it anyway, which we did.

Mr. LEHMAN. Could you expand on the term "nonstandard"?

Mr. HIGGINS. I could. We have really three main types of girders in the system. We have the standard girder, the 88-foot-long girder. Then we have the special long girder, some of them 108 feet long. And then we have another series about, as I remember, about 100 of relatively small girders that fit into various sections of the system, where the contour of the system is changed.

Mr. LEHMAN. I want to be sure that standard meant not quality, but the length or size, and I feel much more reassured that you have gone on the record to reassert the fact that the girders do not present a problem in any way at this time.

Mr. LEVITAS. Thank you, Mr. Lehman.

Let me start off by asking a few questions. In light of the interest that members of the panel have, I will restrict to the extent I can my questions on the first round, and give other members an opportunity as well.

I want to start off with a comment to put some things in perspective, Mr. Stierheim, because I sense the pride which Mrs. Oesterle, yourself, and the others connected with this system feel as expressed today, and I think I in my opening statement made some comments about.

I don't know of anybody, owner of a system or a property, engineers or designers or anybody, who ever sets out to build anything other than a success. No one that I know sets out to build a failure or to operate a failure. Unfortunately, our experience has been that we do have failures. I have seen too many bridges that have collapsed or buildings where the roofs have not worked, or bridge piers like I saw last Saturday up in Tampa Bay that may have some problems with them. And after this experience—I am not an engineer, either—I will say that I approach these problems with a great deal more humility than some of the people who appear to be responsible for their design and construction, because frequently our confidence or overconfidence is belied by what happens later.

I am troubled that at least $1.5 million of taxpayers' funds are now being devoted not to building something, but to writing reports about what may or may not have been wrong, and I am sure that you feel the same way. You would like to see those funds go into concrete and steel and not into consultant fees for $1.5 million worth of reports about the system. That is what brings us here today.

I have, as I say, a few questions. I will start off. One, and Mr. Shaw, you might note this because it relates to your responsibil-

ities as ranking member on the Public Buildings and Grounds Subcommittee, it is the issue that Mr. Higgins touched on right at the end there: who should have responsibility for construction management? Mr. Higgins suggests that it should be someone other than the designer, but this is the part of a great controversy today. I will make part of the record without objection an article that appeared in the December 8 issue of Engineering News.

[The article referred to follows:]

ENR News
The McGraw-Hill Construction Weekly
December 8, 1983

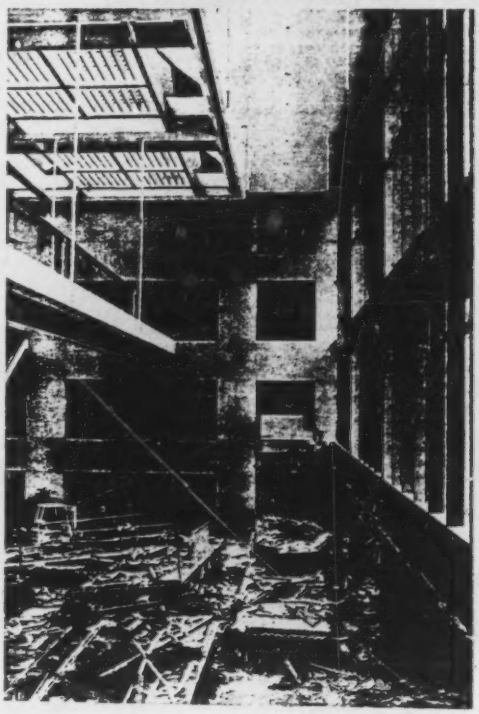
Designers must regain control

Design professionals must "regain control of the construction process" if structural failures are to be prevented.

That is one of the principal conclusions issued last week from an Engineering Foundation conference on structural failures in buildings. The conference, held last month in Santa Barbara, Calif., brought together 60 engineers, architects, owners and officials, plus others in law and insurance.

The conferees concluded that design professionals should have responsibility for the safety of the basic design, the structural details, shop drawings, field supervision and the verification of structural-safety-related matters. Too often, they agreed, design professionals do not have control over all of those aspects of construction.

Conference-organizer Edward O. Pfrang issues recommendations to prevent failures.



Recommendations produced by the conference:

• **Life-safety.** The design professionals must assure that a building is safe for occupancy and certify that all safety requirements have been met before a certificate of occupancy is issued.

• **Redundancy.** Structural integrity should be improved by design concepts and details that assure ductility, continuity and redundancy. Nonredundant structures should be avoided, or designed and constructed with a higher level of safety. Standards groups should recognize the need for higher load factors for nonredundant structures.

• **Peer review.** Buildings above a certain threshold should have a comprehensive review of structural design done by an independent professional, or by the local building department if the department has professional engineers who could do a thorough enough job. The threshold would vary according to building occupancy, size and the degree to which a design is unusual.

• **Assignment of responsibility.** A document should be developed setting forth the many areas of responsibility in the design and construction of a building. This document could be a checklist to help all involved in the construction process understand where responsibilities are assigned for life-safety considerations. Since the assignment of responsibilities can vary from project to project, several models need to be developed. This document should be prepared and agreed upon by a representative group from national societies of designers, owners, regulators and contractors.

• **Risk insurance.** The insurance industry should develop a blanket, all-purpose risk policy to cover all members of a project team through the design, construction and occupancy of a building. Such umbrella coverage could help restore cooperation and teamwork on projects by removing some of the legal friction that now exists between the different professionals responsible for a project. Such coverage would also remove current impediments to communication among members of the building team.

Speakers at the Santa Barbara conference discussed past building failures and their lessons.

The organizer of the conference was Edward O. Pfrang, the executive director of the American Society of Civil Engineers. Pfrang, formerly with the National Bureau of Standards, led that agency's investigation into the walkway collapse that killed 113 persons in the lobby of the Kansas City Hyatt Regency Hotel in July, 1981. ■

Mr. LEVITAS. The headline is "Designers Must Regain Control," taking the opposite point of view based on a conference that was held recently in Santa Barbara, Calif., with engineers and architects and insurance executives and the like, in the aftermath of such things as the Kansas City hotel collapse. My question is, I don't know if you are familiar with this piece at all——

Mr. HIGGINS. I am.

Mr. LEVITAS. How would you respond to the point they make?

Mr. HIGGINS. I would say that because designers do not have the final responsibility for construction management or the day-to-day responsibility, while they certainly have an interest in it, and should participate in it with the client or the owner, but staff on the front lines, the inspectors and the residents and the construction management staff I believe ought to belong to somebody other than the designer. I can say that even if you say the designer will have control, the contractors will always go to the owner because they don't get the answers from the designer. And the owner holds the pursestrings.

Mr. LEVITAS. We have heard allegations that the inspection and testing of the girders was placed in the hands of the people, the firms that made the girders. Would you comment on that? It has been alleged that the inspection and the testing of the girders was given over to the people who made them.

Mr. HIGGINS. I am not aware of that.

Mr. STIERHEIM. The testing is all done by independent engineers.

Mr. LEVITAS. This Raths firm.

Mr. STIERHEIM. Sure.

Mr. HIGGINS. May I comment on it?

Mr. LEVITAS. I am not talking now about the quality assurance aspect. I am talking about the quality control.

Mr. STIERHEIM. Testing of the girders.

Mr. LEVITAS. Is done by an independent testing firm.

Mrs. OESTERLE. Yes.

Mr. STIERHEIM. We may be on the site, or using some of the equipment, but the engineer—go ahead.

Mr. HIGGINS. All of our contracts require the contractor to be responsible for quality control. That does not mean that we don't police them, and when we found out that our joint venture was not following through with a proper quality control function, which is required by this contract, we got after them to put it in.

Mr. LEVITAS. What is the State role, Mrs. Oesterle, in the management supervision, oversight of this project?

Mrs. OESTERLE. The State has no management except where it covers a State road or goes over a State road or under a State road. There is no management from the State whatsoever. It is done locally, all of it.

Mr. LEVITAS. I first of all wanted to commend one particular aspect of what I have heard and seen, so far, and that is the joint-development concept, and the tying in of the transit system with development. It makes sense and it certainly produces benefits for the county.

My question, which is not really necessarily related to that, is, Why was the decision made to operate this property, this transit

system, as part of the county government rather than through a separate authority?

Mrs. OESTERLE. Well, we felt we could do it better. We had one authority here, the water and sewer authority, and it was a completely separate authority from the commission. We approved their budget, but that was just about the extent of it. Just recently the commission voted to abolish that authority, because the commission felt that under the strong-manager-type government, that we could do a better job of overseeing this than an authority.

Mr. LEVITAS. I just have two more questions on this go-round. Is there a dedicated tax to support this system?

Mrs. OESTERLE. Not yet.

Mr. LEVITAS. How much, what percentage of the cost of operating your bus system today is subsidized by the Government?

Mr. HIGGINS. We get about 40 to 41 percent out of the farebox.

Mr. LEVITAS. And about 60 percent approximately, 60 percent or just under 60 percent?

Mrs. OESTERLE. Some 58 or 59, 59 percent.

Mr. LEVITAS. Is in the form of some local or Federal subsidy?

Mr. HIGGINS. Or Federal, that's correct. Last year, if my memory serves me right, our county budget had $31 million as its subsidy.

Mr. LEVITAS. Do you have any legal requirement as to the percentage of subsidy over and above the farebox revenue?

Mr. STIERHEIM. This year it is $52 million, which includes STS about $2 million. There is not legal restriction. The intention I believe of the board of county commissioners is to try to secure a dedicated funding source. We feel that it would be a mistake to put that issue before the voters until the system is up and running, and so probably within the next 2 years the commission will address that issue and put it on the ballot.

Mr. LEVITAS. Our experience, in fact, the subcommittee issued a report last year about the future of transit, focusing in part upon the rather significant increases in the operating costs of systems, and I was wondering whether or not there is any anticipation or have you got any ideas that if you go to a dedicated tax, that you would by law restrict a portion of it for capital requirements as opposed to making it all available for operating?

Mr. STIERHEIM. There are three ways to answer that. The decision hasn't been finally made. One way is to go to the sales tax. Another way is to go to a ninth-cent gasoline tax which would fund perhaps 50 percent or more. As far as the capital is concerned, if you went to a sales tax, a portion of the sales tax could be committed for capital and a portion committed for operating. Obviously, if you went with a portion for operating, then you could reduce property taxes, because a substantial portion of that $52 million comes out of property taxes.

The third element is a decade of development for the eighties. We had a bond issue prepared. We only floated a $200 million issue by referendum for jails, because of the crime problem and so forth, and that passed handily. But we may, subject to a policy decision of the board, go after a second general obligation to come up with the capital. So some combination of those alternatives will be discussed and the decision made on it probably in the next 48 months. A lot of that depends on the state of the economy. One reason we held

off on that issue obviously was because of the recession and problems that we were experiencing.

Mr. LEVITAS. That is perfectly understandable, given the fact that you are hoping to open the system next year sometime, obviously the climate would be more favorable after that. I would simply refer you to our last report on this subject, because I think it is instructive as to what can happen if you don't dedicate and insulate a significant portion of your dedicated tax to capital, because if you just leave it wide open, it is there for people to eat it up pretty quickly.

I have more questions, but at this time I will recognize the gentleman from New York.

Mr. MOLINARI. Thank you, Mr. Chairman.

We have heard testimony that KTG might have overdesigned the hammerhead pier caps, and we have also heard and read some testimony that at some point in time KTG was relieved of the construction phase of the job. The first question I have is who was responsible for selecting KTG, and by what process was that selection made?

Mr. STIERHEIM. That decision was made before I became county manager, but it was a selection process that ultimately was presented to the county commission. It was done under competitive arrangement, we secured proposals, and there was a negotiating committee that negotiated the contract, and I would say——

Mrs. OESTERLE. It was 10 years ago.

Mr. STIERHEIM. As Commissioner Oesterle said, that happened about 10 years ago. I can't tell you how many other competing groups were in that group. I am not sure there is anybody here that can. I can find it out for you. It was all public and competitive.

Mrs. OESTERLE. It was competitive bid.

Mr. MOLINARI. We have no idea as to the scope of the competition. [Voice heard.]

Mr. STIERHEIM. Alan Wulkan again.

Mr. MOLINARI. Mr. Chairman, I would ask that the witness who is offering information be sworn in.

Mr. LEVITAS. Yes. Mr. Wulkan has made several observations up to the point, and you may be making some more, so if you would raise your right hand.

[Witness sworn.]

Mr. WULKAN. Because the transit group was selected in a competitive process with three or four proposals. I am not sure we went all the way to final negotiations with four, it might have been three, but there were three to four proposals when the preliminary engineering proposal was finished, and we decided to go with a final designer for the system.

Mr. MOLINARI. You say "we." Who was involved?

Mr. WULKAN. Metropolitan Dade County. There was a professional staff appointed by the county manager who made the selection and a recommendation, I should say, to the county manager, who then made that recommendation to the Board of County Commissioners.

Mr. MOLINARI. Maybe you had better stand by here. There are a couple of other questions that I have.

Mr. Higgins, on pages 14 and 15 of your testimony, you list, I think it is, four reasons for the transfer of construction managenent from KTG to the Metro-Dade Transportation Administration. You indicate that MDTA had adequate staff on board to handle construction management of this $1 billion project. Now I know there has been a lot of controversy about the TSC report, but in that report they said that KTG had approximately 80 people in construction management operations, while in October of 1981, at the time of the MDTA takeover, the county had only 20 people.

Now the first question I have is, are these figures accurate that I have quoted?

Mr. HIGGINS. I am not sure they are, but I can say that when we took over the construction management function from KTG, we took practically all of the personnel they had working in the function right into our department.

Mr. MOLINARI. You hired them from KTG?

Mr. HIGGINS. That's right. All that wanted to come we took, and I can only off the top of my head remember a few that elected not to come. The other issue——

Mr. MOLINARI. That is very interesting. I get the impression that it was taken away from them because of questions as to whether they could adequately supervise, but yet, to some extent, MDTA has been using the same people to do the supervision.

Mr. HIGGINS. Yes, but it was coming from the top, and the contractors were coming to me every day for nonperformance. They were not getting their shop drawings back. They were not getting redesigns on time. They were not getting the type of construction support that was moving the job along.

Mr. MOLINARI. Do I understand then, Mr. Higgins, that the prime reason why KTG was replaced was because they were moving too slowly?

Mr. HIGGINS. There were a series of reasons. My boss, John Dyer, was involved in it too, and they had lost their construction manager, the head of their construction management, in fact.

Mr. MOLINARI. KTG you are talking about?

Mr. HIGGINS. Yes, and John Dyer was not really satisfied that there was the initiative and drive to do the job, and talking again from memory, almost 3 months went by, and that man hadn't been replaced, even though Mr. Dyer constantly went after KTG to replace him. So that coupled with the fact that the shop drawings were not moving, coupled with the fact that the construction—and we didn't have a great deal of construction on the street at that time, we were just really trying to get off the ground—wasn't going the way it should go, were all reasons that contributed to our taking it over on a phase basis.

Mr. MOLINARI. What I am trying to get straightened out is that you had approximately 20 people on line at your department before you took the KTG employees with you. You were not employed at that point in time?

Mr. HIGGINS. Yes, I was. I was the deputy.

Mr. MOLINARI. You were the deputy at that time?

Mr. HIGGINS. Yes.

Mr. MOLINARI. I see.

Other than yourself, what upper level people were there, so that when you assimilated the KTG employees, they were able to be folded into a so-called smooth operation?

Mr. HIGGINS. We had William McDaniel, who was head of our construction at that time, and he had under him several key construction people, one of them Jim Martin, who I had brought with me from Boston, probably one of the most experienced transit construction managers there is in the game today. We felt that really with the nucleus or the cadre we had of really trained construction transit construction managers, plus the field people that Kaiser had, that we could build a good team, which I think we did.

Mr. MOLINARI. How long did it take you to build that team?

Mr. HIGGINS. Oh, I would say probably——

Mr. MOLINARI. Let me qualify the question in fairness to you. I would assume that just taking employees from another company, in view of the complexities of some of the construction work, would necessarily involve some training, some division of functions.

Mr. HIGGINS. Well, it did, but we didn't just cut the line off like that. It was a gradual assimilation of the people, and we had a Thursday morning every week with the KTG people and our own key people, so that we would smoothly bring this transition about. If I were to guess, I would say that somewhere between 4 to 6 months the transition took place.

Mr. MOLINARI. It is safe to assume there was some lost time during this transition period?

Mr. HIGGINS. I don't think so.

Mr. MOLINARI. You don't think so.

Mr. HIGGINS. I can consult with my top construction man here.

Mr. MOLINARI. That is OK. Mr. Dyer—is it Dwyer or Dyer?

Mr. HIGGINS. Dr. Dyer.

Mr. MOLINARI. Dr. Dyer. His departure was one of the factors?

Mr. HIGGINS. No.

Mr. MOLINARI. No?

Mr. HIGGINS. Not at all.

Mr. MOLINARI. He was moving slowly when he was in position, was he? No?

Mr. HIGGINS. No.

Mr. MOLINARI. So his departure had nothing to do with the decision to——

Mr. HIGGINS. But the decision to make the change went unilaterally with me. John Dyer was the transportation coordinator at the time, and very unhappy with construction for a considerable period of time before the change was made.

Mrs. OESTERLE. Mr. Chairman.

Mr. MOLINARI. You would like to add something?

Mrs. OESTERLE. Yes, I would just like to add that it was also a decision when it was brought to the commission by the management, that was a unanimous decision of the commission.

Mr. MOLINARI. I am sure of that. The question that I am trying to determine in my own mind, which is one of the key elements to this whole puzzle, is——

Mrs. OESTERLE. Why we took their people?

Mr. MOLINARI. Why you hired KTG, and then, after hiring them, had some problems with their design, and then problems with their construction management.

Mrs. OESTERLE. What happened is their top management left.

Mr. MOLINARI. You are nodding your head yes.

Mr. STIERHEIM. What you say is true.

Mr. MOLINARI. I just wanted to get that in the record.

Mrs. OESTERLE. Their top management left, that was one reason. They left the position unfilled for 4 to 5 months, it was unfilled. That was one of the reasons that the commission decided we had the in-house staff to do this, and we hired some of their better people that were under top management, in order to assimilate them in with our group to get a good team.

Mr. MOLINARI. That is what I was trying to arrive at before.

Mrs. OESTERLE. Yes.

Mr. MOLINARI. In other words, there were some top management people, as you characterized them——

Mrs. OESTERLE. That were missing.

Mr. MOLINARI. Who were missing. And as a consequence you people felt that the job was suffering, and that you did have in fact that kind of management personnel.

Mrs. OESTERLE. That's right.

Mr. MOLINARI. At your disposal within your department.

Mrs. OESTERLE. That's right.

Mr. MOLINARI. And by taking some of their employees and folding them into your operation, you felt it was a better decision, and that the job was able to——

Mrs. OESTERLE. Were positive it was a better decision.

Mr. MOLINARI. Positive. I like those kinds of words.

I too have a lot of other questions, but in fairness to the other members on the committee I will pass at this time.

Mr. LEVITAS. We will be coming around again, Mr. Molinari. The Chair recognizes Dr. Rowland.

Mr. ROWLAND. Thank you very much.

Mr. Chairman, may I first say to Congressman Lehman I appreciate very much the opportunity to be here today and I thank all of you for the information that you are giving to us. I look forward to learning more about what we can do in the future to prevent problems developing in other systems that are being constructed.

I want to ask something about the private enterprise that is going on in conjunction with the system here now. During the last Congress we had the tax reform measure before us, and one of the reasons that didn't pass was because of IDB's being excluded. I was wondering how widely IDB's are being used here in relation to construction of the transit system? Are industrial development bonds being used here for private enterprise, and if so, were they authorized for sale by the county, and how did you go about making the decision to do that?

Mrs. OESTERLE. We don't have them. Go ahead.

Mr. HIGGINS. In these two projects, Green projects out at South Dadeland and North Dadeland, I am not aware of any.

Mrs. OESTERLE. There are none to my knowledge.

Mr. LEVITAS. Will the gentleman yield?

I was told this morning, I think by Mr.——

Mrs. OESTERLE. Green?

Mr. LEVITAS [continuing]. That something in the neighborhood, I don't want to give the figure, but there was a significant reliance and planned reliance on IDB's for that project. I asked how they intended to finance it, and that was the information I have. Is there anybody who can——

Mr. HIGGINS. Yes, Dadeland South evidently is using some IDB's. We don't know to what extent, but we will find out.

Mr. LEVITAS. And are they authorized by the Dade County Commission? Is that how they come into being?

Mr. STIERHEIM. They have not been sold, but they have been—do you want to comment?

Mr. LEVITAS. Would you identify yourself?

Mr. SCURR. Charles Scurr.

[Witness sworn.]

Mr. SCURR. The county has an industrial development authority that will be working with the Green Co. and the county commissioners in marketing IDB's for Dadeland South. We don't anticipate selling any at this time for the Dadeland North project, but they are parts of the package for Dadeland South.

Mr. ROWLAND. The question I have is that the people who are developing hotels and things of this nature, are IDB's being sold to help develop them? I am just trying to get some idea, because there has been some talk about changing the way that IDB's are being sold in the country.

Mr. SCURR. It is my impression they are in the Dadeland South.

Mr. ROWLAND. Do you have an idea how many?

Mr. SCURR. I can get you those facts. I don't have them with me. I am sorry.

Mr. LEVITAS. Would you submit to us for the record the proposed use of industrial revenue bonds in connection with private sector joint development——

Mr. SCURR. I can give you the whole financing plan.

Mr. LEVITAS. The information I had is that they are also contemplated for use in Dadeland North, but whatever the facts are, if you would submit them to us so we would have them for the record.

[The following was submitted for the record:]

Development, joint development and redevelopment are occurring all along the Metrorail alignment. The private and public sectors are participating in substantial and meaningful projects in all areas of the community. Examples include joint development projects at Dadeland South and Dadeland North; development projects at South Miami and Coconut Grove; and redevelopment projects at Overtown, Martin Luther King Jr., and Northside.

Dadeland South is the first major joint development project on the Metrorail System. Metro-Dade's joint development partner the Green Companies, will be developing a 900,000 sq. ft. Office, Commercial and Hotel development. This development, which includes 1,000 parking spaces for the Metrorail System, is an integral part of the Dadeland South Station. The total cost of the development is projected to be $106,000,000.

Dade County and the transit system will assume an equity position in the development. In addition to the 1,000 parking spaces, MDTA will receive 4% of the annual gross revenues of the development project. This is anticipated to yield in excess of $1,000,000 annually. These proceeds will be used for additional transit projects and/or to offset the operating expenses of the transit system.

A number of mechanisms and sources of financing are being utilized for this project. This includes the use of industrial development bonds. The financing is summarized below:

Phase	Description	Financing
I	Office (200,000 square feet) transit and office parking garage (1,000 spaces transit, 650 office.	$19,600,000 conventional. $11,500,000 industrial development revenue bonds.
II	Hotel	$25,000,000 conventional.
III	Office (200,000 square feet)	Do.
IV	Do.	Do.

Dade County feels the ability to use IDB's has been a very positive one and has benefited the public sector and public. IDB's are under consideration for use at a number of other projects including Dadeland North and Martin Luther King.

Mr. ROWLAND. I have a couple of other questions, Mr. Chairman.

One of the persons I understand who is now involved in quality assurance activities is Mr. Jack Crognale. Can you tell me something about his background and what his responsibilities are?

Mr. STIERHEIM. He is right here. I will submit his resume to the committee if you would like.

Mr. ROWLAND. Just generalities.

Mr. STIERHEIM. He has been in construction for I believe 25 years. He is a graduate engineer. He worked on the Boston system.

Mr. ROWLAND. How many people were involved in quality assurance say 2 years ago as compared to now?

Mr. STIERHEIM. I initially hired, appointed Herb Priluck as the initial incumbent in this position. He subsequently hired Mr. Jack Crognale. Mr. Priluck was appointed before the IG report, certainly long before the TSC report, reporting directly to me. Priluck was a MIT graduate, had been the engineer for the Israeli Army and built a half-billion-dollar airport in the Sinai, had helped build, had construction management responsibility in Baltimore, Atlanta, and Boston. He is currently construction manager for the Bullet Train in California, the San Diego project. Jack Crognale was brought in as his deputy, and I cannot tell you—the staff has gradually expanded from that initial effort. Priluck was appointed in March 1983.

Mr. ROWLAND. About how many people are on that staff now?

Mr. STIERHEIM. Fifty-two, but a good number of those are coming out of KTG, 22 full-time staff.

Mr. ROWLAND. There were only a couple of people a year-and-a-half ago.

Mr. STIERHEIM. A year-and-a-half ago or two years.

Mr. ROWLAND. For the record, would you define the difference between quality assurance and quality control. A few minutes ago we were talking about quality assurance, and then we started talking about quality control. Can you define them for me?

Mr. STIERHEIM. I do not know that I am an authority. I will do my best. Other people might be able to expand on it. Quality control is a system that takes place either before or during construction. Quality assurance is assuring that the goals set by quality control or design criteria are achieved. As such, quality assurance may be going into as-builts, which means structures already constructed, like what we went on this morning, those that are under

construction, and even design problems for future construction. Another essential criterion is total independence in terms of lines of authority and reporting. It is a watchdog kind of activity similar to an external auditor, but there are other people that can be more sophisticated.

Mr. ROWLAND. Quality control precedes quality assurance.

Mr. STIERHEIM. It can take place—yes, it is built into the organization, but it operates apart. Would you like more testimony?

Mr. ROWLAND. No; I believe that explains what I wanted to know. Thank you.

Mr. Chairman, thank you.

Mr. LEVITAS. Thank you, Dr. Rowland.

Mr. Shaw.

Mr. SHAW. I would like to pursue that same line of questioning if I could for a moment. Mr. Higgins, I believe you were the one who made the observation that it was poor policy in your opinion to have the same person who was doing the design also do the management aspect of construction. How do you reconcile that with the quality control and assurance functions, in that the county now is taking the responsibility for construction management?

Mr. HIGGINS. The county has taken over the quality control, quality assurance function, with line command going directly to the county manager, where neither the general consultant nor the Transportation Administration are involved in that line. So they have complete objectivity in reporting their findings to the county manager.

Mr. SHAW. That function is not on the chart of authority which you handed out earlier, unless I have overlooked something——

Mr. STIERHEIM. Congressman, it is down here. We call it inspector general. I don't like that term, I might add, but for want of a better name. Quality assurance director might be more appropriate.

Mrs. OESTERLE. It is on the chart under Inspector General.

Mr. STIERHEIM. Right here, sir, under the DIC, reporting directly to the manager's office.

Mr. SHAW. When the designer, KTG—have I got it right—KTG?

Mr. STIERHEIM. KTG? KTG.

Mr. SHAW. It sounds like KGB. That is why I wanted to be very, very careful. When the designing function was put out for bids originally, I assume it was anticipated at that time that they would take over construction management. Was this part of the contract?

Mrs. OESTERLE. We have got Dr. Schimpeler here, who is the head of it. Alan was part of it. Did you hear the question.

Mr. HIGGINS. It was an option.

Mr. SHAW. Whose option?

Mr. HIGGINS. It was the county's option.

Mr. SHAW. It was the county's option.

My next question is, has consideration been given to whether or not the fact that construction management has been taken away, and that some of the drawings would in fact be changed, could affect their liability, in that otherwise they would have been on the job to make or approve some of these changes, but were not?

Mr. HIGGINS. We don't think that impacts their liability. In particular instances where we have a design change or design modifi-

cation required before the contractor can proceed, we try to make a determination immediately whether it is a design error that would be covered by their insurance, and if our engineers make that determination, we notify them immediately.

Mr. SHAW. Going back to the hammerhead pier caps—I am sure everyone was kind of hoping that would be the end of that—was any effort made to redesign those particular pier caps during the construction period? I assume all of these were constructed after the county took over; is that correct?

Mr. HIGGINS. Yes. There were several efforts made when the contractors alerted us to the difficulty of constructing. The field teams went out. They worked with the cage on the ground or they brought in some of the best people we could find to see how we could simplify it without impacting in any significant way other elements of the system.

Mr. SHAW. How many contractors are involved in the construction of those particular pier caps?

Mr. HIGGINS. We have in the north section Defelice, Wimpey, and Fitzpatrick, and of course they have a subcontractor that is doing I think the bulk of their work for them. Also in the few that we had on the south line, I believe it was also Fitzpatrick who was involved.

Mr. SHAW. You said they were subbing it out. Is the same group of people responsible for the construction of all of these particular pier caps?

Mr. HIGGINS. I don't know. Two of them have the same sub. That was Defelice and Fitzpatrick, and Wimpey Construction had a different sub.

Mr. SHAW. Have they all experienced the same difficulty?

Mr. HIGGINS. For some reason or other, I think Wimpey got along a little bit better.

Mr. SHAW. Does it appear that he is in good shape?

Mr. HIGGINS. Pardon?

Mr. SHAW. Did he have difficulty with them?

Mr. HIGGINS. He had difficulty with them, but he seemed to be able to, with his sub, conquer his difficulties and move ahead with the project.

Mr. SHAW. Have you detected quality differences among your various contractors, material quality differences?

Mr. HIGGINS. I am not sure.

Mr. SHAW. I am confining my questions now to the hammerhead pier caps.

Mr. HIGGINS. Substantially no difference.

Mr. SHAW. Have you asked the contractors why they did not raise the questions during the bidding process rather than waiting until this late hour, and if so, what has been their response?

Mr. HIGGINS. Of course that is typical. They don't raise them before the bid. Often a contractor sharpens his pencil to get the bid, but after the bid, after the winner has started the work, then he raises the view that he thought that cap initially was not in its present——

Mr. SHAW. I believe my question was did you ask them why they had not raised that question prior to getting the bid.

Mr. HIGGINS. I did not.

Mr. SHAW. Or to your knowledge do you know the reason why they didn't.

Mr. HIGGINS. To my knowledge I didn't raise it.

Mr. SHAW. Has anyone—you didn't raise it? I didn't ask you if you raised it. My question is, Why didn't the contractors raise it prior to the bid? It is pretty obvious with all these contractors involved, and with just looking at a picture that you supplied us, somebody, somewhere, in my opinion, should have raised it, and, I think, in your opinion should have raised it. I think that was the impact of your testimony. My question is, Why wasn't it raised?

Mr. HIGGINS. I don't know. I do know that of all of the prebid meetings I attended with contractors, they are extremely careful about what they raise in order not to give one or the other bidders an edge on anything, very, very careful of questions they ask.

Mr. SHAW. But to your knowledge, they didn't go ahead and bid it with the anticipation that they would go back for a design change and get it. That is the impact of my question.

Mr. HIGGINS. I don't think so. I think they probably didn't realize themselves how complicated it was until they really started to build the first one.

Mr. SHAW. Which one of these contractors, or did all of them or any of them, at the time of the original bidding have experience with the construction of this type of rail system?

Mr. HIGGINS. I am not sure any of them did. They all had major construction experience, but I think transit-type construction was probably new to each one of the three.

Mr. SHAW. Either you or Mr. Stierheim made reference to the point that there were many contractors out there, big contractors, nationwide reputation types of contractors, who did not bid this project. Do you think perhaps that this might have been the reason, or did any of them, did anyone who did not submit a bid, raise the question as to the design?

Mr. HIGGINS. No; I don't think so. We bid each one of these line sections separately, and they were not big dollar items. As soon as we started combining bid packages to say the $15 million or $20 million level, we got the top contractors in the country bidding right away.

Mr. SHAW. But to your knowledge nobody refused to bid it because of the design?

Mr. HIGGINS. No.

Mr. SHAW. I have one other question which is somewhat parochial in nature. I see the Green Line appears along the Atlantic coast to the north. My question is, Are there any planning or feasibility studies or thoughts of extending that into Broward County?

Mr. STIERHEIM. The other Green Line going north, Congressman, is the one going up 27th Avenue. I think that is generally the corridor. The Green Line going up along the bay will be up toward the 163d Street shopping center. It isn't cast in concrete at all, but if we did go north on a very preliminary basis at least we would look at 27th Avenue running right straight up into Broward.

Mr. SHAW. West to Fort Lauderdale.

Mr. STIERHEIM. It would be to the west.

Mr. WULKAN. We are also working with the State on a tricounty West Palm-Broward-Dade connection for rail. We are studying corridors for that currently.

Mr. SHAW. One of the big factors when we are talking about airports is the coincidence with what we have in common with the Miami-Fort Lauderdale complex.

Thank you, Mr. Chairman. I yield back.

Mr. LEVITAS. Thank you.

Congressman Nowak, I know you are very much interested in this not only as an important member of this subcommittee, but Niagara County and Buffalo, NY. I am sure are watching with great interest the experience here, in Baltimore, Atlanta, and other places.

Mr. NOWAK. Thank you very much, Mr. Chairman. I guess I should start out by saying that the hammerhead pier cap may become as famous as your hammerhead sharks. Maybe they are already.

Mrs. OESTERLE. They are.

Mr. NOWAK. From the testimony and the background that we were given. I have a couple of questions. In any of the testing that has been done, for any of the different sections that have come under controversy, have there been any variances from the structural design criteria that they were supposed to meet?

Mr. STIERHEIM. They have been exceeded. So far they have exceeded the design criteria both on the girders and the hammerheads. The testing is still out. They are going to run one more test on the hammerheads. To be very specific, in the construction there was some variance with steel that was at a 45-degree angle, its location in relationship to the right angle of the concrete. That is important, and that is what we were testing—piers that had varying distances to that steel, as to the strength. From an engineering standpoint, the further away presumably there at would be a variance. However, when it was tested, we found that the strength was there even though the steel was further away than I think it was originally intended to be, which as I understand it was somewhere between 3 and 5 inches.

Mrs. OESTERLE. Two inches.

Mr. STIERHEIM. But so far that is the only variance that we are aware of.

Mr. NOWAK. How many more of these have to be constructed as you go out to the end of your system?

Mr. STIERHEIM. Twenty to twenty-two.

Mr. NOWAK. Still have to be constructed?

Mr. STIERHEIM. Yes.

Mr. NOWAK. And the opening of your system has been postponed now. I wonder if you could give us any indication as to exactly when you think you are going to have the first 10-mile segment.

Mr. STIERHEIM. I would emphasize, and Commissioner Oesterle may want to comment in addition, that the original target date for the opening of the system was July or August 1984. Over a year ago we picked the date of December 18, and I might add that everyone felt at that time that that was an attainable date. Hindsight being 20/20 vision, we would have preferred not to set a date, because it became a great media event, and we had to postpone for

good and valid reasons, which I think was generally well accepted by the community when we made that decision.

The essential ingredients for the delay were threefold. No. 1, we were running the tests on the hammerhead pier caps on the north end. I was initially told that we would have that information by sometime in the middle of November. There was some slippage because of the time required by the contractors to put the steel and the jacks and everything in place so you could simulate the 500,000 pounds over whatever the test load was, and I wasn't going to get that information until the first few days of December, which would allow only slightly more than 2 weeks, if in fact a fix was required on the pier caps on the south leg. That caused us concern.

Second, we found a design problem in the roof of the Government Center, which the architect engineers, the Kaiser Transit Group has acknowledged would be their responsibility. It took time to design the fix on that, which had to be done underneath. We did not want people on the platform when there was repair and additional construction going on, so that was the second reason.

The third reason was one that has been with us for some time, and that was delivery of the cars. We had a joint purchaser contract with Baltimore. Baltimore was to get their cars first. We were about a year-and-a-half behind on delivery from the Budd Co. We were supposed to have 136 cars by April a year ago, and that was always a marginal question for us, and so we made the decision, the Board supported it, to postpone. We anticipate opening in the spring ahead of schedule, I would emphasize again, but I can't give you a firm date.

We are going to open when we are ready. We are testing cars now. If there are other repairs necessary to any of the pier caps, and there may not be any repairs necessary, we want to effect those. We want the roof repaired, and we want the punch list gone over, which is a very ordinary part of this construction process on critical elements such as communications and so forth to fully check out. I would hope to open in the spring.

Mr. NOWAK. When we look at the problems that have come to light here, knowing that the State has, I guess, participated in the funding, some 12½ percent, the Federal Government, of course, a much larger share, in retrospect, do you believe that some of these problems, if there was a greater amount of oversight by the State and/or by the Federal Government, these problems could have been brought to light and perhaps dollars saved or at least more quality assurance built into the system?

Mr. STIERHEIM. I want to answer in two ways, Congressman, and then Warren Higgins may want to, also.

You know the problem with this is that we are building a billion dollar system that has some 4,200 components, some of which have tolerances like putting a man in space. Take your platform levels—they are very exacting—it isn't just a big piece of concrete out there. This is a very complex system. And it is difficult to build. And there is nothing that has ever been built by man anywhere—I don't care whether it is the Pyramids or whatever—that has not encountered problems. That is ordinary.

It is ordinary for someone to have a punch list on a home or even a car. When you buy a car, you are not going to accept it finally or make your final payments until you get it checked out.

You know, for me to sit here and say that our problems have been exaggerated sounds defensive, because we have had problems. I can't deny that. That was in our testimony; it is in our report. We have had problems. But our problems have been exaggerated.

When I said earlier that we are building probably the safest and the best system in the country, I really believe that. And I am basing that on independent consulting engineers whom I have a great deal of respect for, and who Warren does.

Yes, had we had quality assurance from the beginning, I think it would have been a better construction period. I think it would have been a lot easier on my elected officials and on myself and on Warren, and so forth. I think if we had had the independent auditors monitoring the cash flow, that we would probably have known ahead of time about the shortfall.

Now, as far as the role of UMTA and the State is concerned, I will be honest with you: I have some ambivalence. Essentially, we are responsible to construct the system. We have the responsibility. You provide the dollars. The State provides the dollars. To the extent that the system goes over State roads or interstate systems, I think that is a responsibility for the Federal Highway Administration or the State department of transportation.

I think that a requirement for quality assurance is a good requirement and one that should be considered for future new starts or maybe even some existing construction. We did it in mid-stream. It has never been done before, to my knowledge. And I think that that is something that you might well want to consider.

On the question of the hammerhead pier, difficult design, admittedly. Maybe it could have been designed differently, admittedly. The contractors have built many of them to specifications. They are passing the tests; they will do the job. There is the cost element that you haven't gotten testimony on, but I think if you were to bring up some engineers, they would tell you that the hammerhead as it is designed now is cheaper than steel. That is open to discussion and dispute.

I hope that is a fair answer, because it is a difficult thing. It is not all just white or black.

Mr. NOWAK. What I am trying to really get at is, UMTA, with its very limited staff, in so-called quality control issues, maybe quality assurance, in its oversight capacity maybe could go in many directions. They could hire——

Mr. STIERHEIM. Hire consultants?

Mr. NOWAK. Hire a whole new bureaucracy to come in and have tremendous oversight over these kinds of projects throughout the country.

Another idea that UMTA is going to bring forth, I think, is going to a consultant to perhaps provide over and above the type of quality control that the individual construction manager may provide, have a so-called independent source to oversee the job without hiring a lot of new Federal employees. After all, who pays for that? Maybe out of the construction fund we should set aside some very, very small portion, which might make sense in the long run on

these projects and give a lot more confidence to both the builders of the project and to the people who are going to use it in the future.

We are certainly going to look forward to the UMTA Administrator's response to all of these questions. I appreciate your help. And I think the directions you moved in when you saw the problems coming were very commendable. I think you may have saved a multimillion dollar disaster here by going to the independent auditing system and putting in the extra dollars that you had to to get the quality control. And certainly, as one member of the subcommittee, I want to acknowledge, to both of you gentlemen, and certainly to the county commissioners, all the effort and time that you have contributed. These projects are massive. And not only are they massive, but everybody has a unique project.

I don't care how many you build of these things, every piece of land you build them on is completely unique I want to state that and hope that your experience can be used as somewhat of a level and guide in working out the successful conclusion of other projects.

Thank you, Mr. Chairman.

Mr. LEVITAS. Thank you, Mr. Nowak.

Congressman Lehman.

Mr. LEHMAN. Thank you, Mr. Chairman.

First, I want to compliment you, Merrett, Warren, and Clara, for the quality of testimony that you have provided us today on these very technical and tough questions. I think it will not only be helpful to Dade County but helpful to transit systems throughout the country.

I do have one specific question which may be a little bit redundant in regards to Mr. Nowak's questions.

The Federal Government has been paying 80 percent of the cost of urban mass transit construction, and the Federal Highway Administration pays from 75 to 90 percent of the cost of highway construction.

Mr. Higgins, I understand that the Federal Highway Administration has a requirement that one of its engineers must make an onsite inspection of all highway construction projects at least once every 30 days. That is in addition to State level inspectors who are required to be on the site all the time.

Now, in comparison to the Federal Highway Administration, how often had UMTA engineers or their representatives been on site before the beginning of this year?

Mr. HIGGINS. As a normal procedure, we had a program where every quarter we had a meeting with UMTA representatives coming to Miami, UMTA representatives from both Washington and Atlanta, and we usually had a 2-day session in which we not only reviewed where we were with all of the projects, but also did take them out on the line to show them construction progress.

Mr. LEHMAN. Were those people engineers, or were they administrative people?

Mr. HIGGINS. I know of at least two of them being engineers; others were general.

Mr. LEHMAN. What would you consider to be the most significant piece of construction management assistance you received from UMTA during the design and construction of this project?

Mr. LEVITAS. Mr. Lehman, before you ask that question, may I ask you to yield?

Mr. LEHMAN. Sure.

Mr. LEVITAS. By way of followup on Mr. Lehman's question, which I thought was very pertinent, is the type of inspection or participation by the UMTA officials which you described similar to or different from the type of inspection or observation that FHWA officials perform when they look at a highway project?

Mr. HIGGINS. I would say that it is different. Really, the 2-day seminar-type meetings we had with UMTA every 3 months were really opportunities for Dade County to show them where we were on the project and to have them comment. There was a great deal of emphasis on such things as where we were on the budget, the minority program, any special problems with the contracts. But it wasn't, you might say, any kind of hard-hitting field testing or anything like that.

Mr. LEVITAS. I think the point that Mr. Lehman has been making to me and others is that when we are spending these billions of dollars under the auspices of the Urban Mass Transit Administration, he is raising a concern which I think many of us share: To what extent does that agency know what is going on with the use of those funds along the lines of construction quality assurance?

Mr. LEHMAN. It is a two-way street: How much responsibility should we place on UMTA to see that the proper engineering is being done; but also, how much help are the local people going to need because they don't have the built-in capabilities in many parts of the country to see that it is done right.

Mr. LEVITAS. The gentleman from New York asked the gentleman to yield.

Mr. NOWAK. Thank you for yielding. Some of these questions that are being discussed now are going to be answered by our Administrator, Mr. Stanley, who has looked into these questions I think in a very good and detailed way. And I would just like to mention at this stage—because I think it shows the difference in the kinds of available resources that the various departments have—UMTA at the present time has 20 field engineers to cover the entire country. These are the so-called field engineers available to do any kind of construction oversight. And the Federal Highway Administration has 525 engineers who are working and engaged in performing construction management oversight, and all of them I understand are now working at their full capacity.

The suggestion could be to swing some of these highway engineers over to oversight on projects of this magnitude. But again I turn to the uniqueness of a system like has the one that has been developed here in Miami. It is so completely different from building a four-lane highway, so that even those highway engineers would not have the capability. So I think you have got to go out to a specialized firm who has some national reputation to come in and perform that oversight.

Mr. LEVITAS. The gentleman from Florida.

Mr. LEHMAN. I yield back the ball.

Mr. SHAW. Would you yield on that point?

It seems that Mr. Lehman opened a new can of worms on that type of thing. During the testimony, I have been sitting next to Mr. Stanley and I have had the opportunity to ask him various questions about what was being said. One of the questions that I did ask him was whether or not the Federal Government signed off on the arrangement that was made when the construction management was taken over by the county. And, as I understand it from talking to Mr. Stanley, it is not the function of the Federal Government to sign off on those types of things.

It appears from the testimony, at least that which we have received so far, that Metro-Dade may have assumed this job very successfully, but it is a little scary when you think about the tremendous amount of Federal dollars that are being spent without additional controls as to what is to be the concern of the Federal Government.

There is no question in this particular project that Metro-Dade is going to either be the goat or the hero, and it appears that things are breaking pretty much the way the county would have them when all things are taken into account.

But one of the things that we are doing in these types of hearings is looking at what is the Federal law, what is the existing law, and what changes or possible changes should be made. It may be that there should be a signoff function for UMTA. You have to remember when we talk about the few engineers that the Federal Government has in its employ, that the local governments are acting as the agents of the Federal Government. It is not a big brother type of thing that we are trying to impose, but I think we should have—as the Federal Government, having the responsibility for the tax dollars—we should have some responsibility to at least have oversight authority administratively as to the procedures that are used in setting up engineering contracts and determining exactly who is in control, so we can be sure on this project, as all other projects, that the people that are making the decisions are qualified engineers.

I don't mean my statement at all to reflect upon what is going on here in Miami, but it is a little bit surprising to me that a local government could take over a project without the Federal Government having signed off on it.

Mr. STIERHEIM. I wanted to just expand on what you have said, Congressman, and what Congressman Nowak was saying before.

We are functioning very well, and with a high degree of confidence, I might add, with our consulting engineers who are running tests and performing that kind of service, Raths, Raths & Johnson, which has done tests on the pier caps and continues to do them, and was involved in the girder testing and so forth, and the current consultant, Morrison-Knudsen, which was hired after a screening process by UMTA, and is here now. I might add that they are here at UMTA's request following the TSC report.

I am just sorry that once the IG got through with his field review that we didn't hire Morrison-Knudsen then to come down here, because they are working with us. I almost look upon them as our engineers, in a way, in providing oversight responsibility. They are checking—they are reviewing what Raths, Raths & Johnson is doing on our testing. They are collaborating, sharing their engi-

neering expertise, and so forth. And I think the public, UMTA and Metro-Dade County are benefiting by that process. That is a healthy process in addition to the quality assurance.

So I am agreeing with you, sir, in what you are saying.

Mr. NOWAK. If the gentleman would yield, I would like to add that the Morrison firm—you may consider them a working partner, but the mere fact that they are completely financially independent——

Mr. STIERHEIM. They are.

Mr. NOWAK [continuing]. Of this county is going to provide the credibility that this system needs.

Mr. STIERHEIM. That is right.

Mr. NOWAK. I think that is a very, very important point. And that is why I am suggesting that an independent third party firm could be the least costly way to solve all these problems.

Mr. LEVITAS. The question, of course, that Mr. Stierheim's observation about Morrison-Knudsen raises in my mind is one which should be addressed perhaps by the representatives from UMTA today, because if Mr. Stierheim has no confidence in the Cambridge TSC operation, which is the Federal Government's arm, it is the same thing Henry is suggesting that we ought not to have GAO make studies but hire independent consultants, because there can be a lack of credibility in GAO. Until somebody proves that to me, I am not prepared to accept that fact.

As I expressed earlier, I am concerned that we have seen almost a million and a half taxpayers' dollars tied up in reports, and now we have got a third one. That is not to in any way denigrate Morrison-Knudsen; I accept their expertise.

But why should I at this point question the objectivity or the competence of the TSC operation? And if it is subject to question, then it seems to me it is the responsibility of the Secretary of Transportation—I am trying to phrase this in acceptable public language—to make very sure that they get in line and shape up so that we don't have to go to outside consultants, because the credibility of an arm of the Federal Government doesn't exist. I think a real fundamental problem is raised by this.

Yes, Mrs. Oesterle?

Mrs. OESTERLE. Mr. Chairman, you would almost have to read this full report to know why we disagree with TSC.

Mr. LEVITAS. I am going to ask if a copy—I don't want to put it in the record, for obvious reasons—but may we have a copy of it?

Mrs. OESTERLE. Yes, sir.

Mr. LEVITAS. Our staff has gone through portions of the report, and I am not saying TSC is right and you are wrong. You understand?

Mr. STIERHEIM. Yes.

Mr. LEVITAS. I am just saying that somebody—namely, you and me and the other taxpayers—are paying TSC to do a job. Now, if they are not doing that job, it is my responsibility as chairman of the Oversight Committee to say to Mrs. Dole, "Why aren't you getting people at TSC to do the job right?" That is the point I am making.

Let me ask this question: Who makes the railcars?

Mrs. OESTERLE. Budd Co.

Mr. LEVITAS. I am sorry?

Mr. HIGGINS. Budd Co.

Mrs. OESTERLE. Philadelphia.

Mr. LEVITAS. And how much do each of those cars cost?

Mr. HIGGINS. Approximately $850,000. This is a joint contract with Baltimore, and as a result of the joint contract we expect we save about $50,000 apiece on them.

Mr. LEVITAS. I understand that they are behind schedule in making deliveries to Miami. Could you give me some information for the record about that and what are the reasons for this?

Mr. HIGGINS. Let me start off by saying that at this time we should have our full order on the property of 136 cars—that we should have had the full order on the property a year ago. I think our latest count yesterday was 18 cars. They finished the first 58 for Baltimore. We got them to cut the line to give us some cars, and then they will go back into the line and finish out 78 for Baltimore.

It is very difficult for me to give a reason. I visited the plant over and over again, and it is a plant that is quite different than any other carbuilding plant I have been in as far as being organized with good working stations and materials going to the work stations.

They have had a change in management. They brought in a new president about a year ago. They are a 100-percent German-owned company. And we finally have convinced them to bring in some talent from Germany, which they have. They brought in about 18 car engineers from Germany, and also an individual they call Ober. Whether he acts over the president or not, I don't know. But if we were to, as of this moment in time, assess liquidated damages, we would be entitled to the maximum on the contract, or about $9 million. But we need the cars.

Mr. LEVITAS. Is it primarily because of the lack of adequate experience in management that this has occurred, in your opinion?

Mr. HIGGINS. At least two things probably happened that set them back, but in no way do they account for the delay that has been incurred.

The first instance was a strike at one of the major suppliers, Westinghouse Airbrake, Webco, maker of the brake component, and that did set them back a little bit. Then, second, they had not set what they called bogies on our car. Our car is a rather sophisticated car. It is much more sophisticated, for example, than the Chicago transit car, which is a cam-controlled car without a chopper.

The men at the plant would prefer to work on other orders than the Miami-Baltimore order, because they make more money, because they have efficiency bonuses set for particular labor operations.

We finally, after almost a year of hassling, have got temporary bogies set on the Miami-Baltimore cars.

A third factor was that Budd reached an agreement with its labor union to swing over manpower that was primarily automotive into the rail field rather than lay them off, and those people had to start up the learning curve.

Mr. LEVITAS. Some problems were identified early on in construction of the University Station. What were the problems, and have they been corrected?

Mr. HIGGINS. Yes. Initially, we had a contract or that was just not capable either engineering-wise or financially. We finally, after warning the bonding company over a period of several months, did terminate them, got the bonding company to take over the job, and before the winning bidder accepted the job a complete and thorough survey was made by an independent engineer of all of the deficiencies, so that the new contractor doing the job wouldn't be penalized for making these fixes.

All of those fixes have been made. The bonding company has done a splendid job handling it.

Mr. LEVITAS. At the Government Center Station, there have been problems of leaking or bubbling of the roof. Is this problem confined to that station, and what is being done to correct that problem?

Mr. HIGGINS. The bubbling, I think you are probably referring to the liquid finish they put on the roof.

Mr. LEVITAS. That is correct.

Mr. HIGGINS. The bubbles and breaks and so forth. We don't have any problem at the Government Center Station with this problem. We do have it at several other stations and substations.

Now, we have put a seal on it, but we are not satisfied with it. And we have got an expert on roofing coming in that will not only tell us the proper fix on these stations, but also the type roofing we should use on the north stations which have not had roofs put on yet.

Mr. LEVITAS. Let me ask you, Mr. Stierheim and Mr. Higgins, this question, and then I only have one more after that: What do you see UMTA's role in your project to be? What services do they provide you other than writing checks, for example? What degree of approval or involvement? Is there an active participatory role by UMTA, or are they simply there so that the god of the mountain will provide rain or water the fields to provide the crops that we all enjoy so much?

Mr. STIERHEIM. We look to them for that, too.

Mr. LEVITAS. What I am trying to find out—and this really goes to the heart of why, one of the reasons why we are here on this hearing today—I am trying to find out what role does UMTA really play other than being a conduit for issuing checks and accounting for funds, from your perspective as the manager of this particular property. I know you deal with other agencies of the Federal Government—Federal Highway Administration, Environmental Protection Agency—who have construction grant programs?

Keeping that as sort of a backdrop, what is it that UMTA is doing as far as building mass transit systems in this country?

Mr. STIERHEIM. My experience has been very truthfully a positive one, and I have had 25 years of experience in dealing with Federal agencies. Aside from the one period of time, where we were into the response and what precipitated it and so forth and so on, it has been a positive response. I have felt—and I say this pro-

fessionally—that they have administered the programs of Congress and done it capably. I think that they have tried to be fair.

There are always competing interests for these dollars. We are competing with Houston and Los Angeles and Buffalo and everybody else. And I have found that they are fair and that they are sympathetic.

I think—and I have shared this with the new Administrator—that what would come out of this I hope is a requirement for the quality assurance function. And I think that in addition to that, some type of—you may wish to explore some type of consulting arrangement for an oversight responsibility.

For example, we had a peer review committee, which hasn't been discussed here, which was made up not only of a representative from UMTA, but top construction experts who were hand-picked by the previous Administrator. Alan Kiepper and other people who are recognized for their construction and management ability came in here periodically and provided reports. We always did very well on those peer reports.

Now, admittedly they weren't here for weeks at a time evaluating. They weren't here testing the design of a system and so forth. So you are asking a very fundamental question as to whether or not the role of UMTA should be increased in its oversight responsibility.

I think that that can be done through the requirement of quality assurance, and conceivably through the use of a consultant. But beyond that, I would hope that you not move in the direction of the Federal Highway Administration, for whatever it is worth, and set up that type of an organization. There you are primarily building Federal roads. Here you are building a transit system for Metro-Dade County that you have contracted with through a full funding agreement. You hold us responsible, the taxpayers hold us responsible. I think with some modifications we can strengthen this system and learn from the unfortunate experiences that we have had and other jurisdictions have had.

Mr. LEVITAS. Mr. Higgins, do you want to add anything to that?

Mr. HIGGINS. I would like to also say that my experience particularly with the region has been a positive one. The regions individually have come down from time to time when we have needed help or have wanted to discuss an issue. I named Gene Carroll a little earlier on the hammerhead pier cap issue. He was not involved in any of the design or anything else on that cap. But later on when we were having some brainstorming sessions on it, we got Gene down to sit around the table with us and give us his ideas, too.

Also in the development of our projections on the future use of businesses to support our transit system in, say, 1985, two or three of the UMTA regional planning types have come down and sat around at work sessions with us. They are limited in their staff. But when we call on them for help, I can't remember any time that they haven't helped.

Mr. LEVITAS. But they are not really looking over your shoulder?

Mr. HIGGINS. Not at all.

Mr. LEVITAS. The way FHWA does?

Mr. HIGGINS. Not at all.

Mr. LEVITAS. I think I have a better sense of that.

Let me ask this last question, Mr. Stierheim, and I ask this question really because something has struck me as I have gotten into looking at this situation here. I believe that the questions that have been asked so far have been fair questions, objective questions. All the questions may not have been right on target. I think they are fair. But ever since I have started looking, reading, and talking to people about the Metrorail system here, I have sensed an air of overdefensiveness.

In a comment that you made earlier, you said that nothing that you build—and the bigger it is, the more likely it is to have problems—nothing we build is perfect; we all know that—the punch list on the house, the car that you take back under warranty. The greatest experts in the world build our space shuttle, and the rockets didn't work right and computers go down. We all know that nothing of this magnitude is going to be 100 percent.

You have been a public administrator for 25 years, I think you said, and whether it was a zoning decision or the location of a waste treatment plant or whatever it is, I doubt that there is anything you haven't done where you haven't been subjected to criticism, to political pressures and the like.

I am suggesting to you that I sense an unusual air of defensiveness about the questions that are being asked about the Metrorail system, and I ask this in all candor: Is there some reason for that?

Mr. STIERHEIM. I really appreciate the question. It shows an empathy and a sensitivity that I respect, and I think we all do. I will speak for everyone here.

I stated earlier that I felt that there had been some exaggerations of our problems, and that is not to say that a fix on a pier cap is not important or that these tests are not important. They are critically important. They are absolutely essential.

We live in an environment here where this particular project has taken on tremendous public interest and concern as expressed through our fourth estate, the media, and they certainly have a right and an obligation on behalf of the people to point out where we make mistakes, and to bring that information to the public. That has been done extensively.

We went through some painful experiences with regard to the prior study that precipitated this, and how it was released and how we were allowed to respond—or not allowed to, I might add—and then we subsequently did, and so forth. So your perception on our being somewhat defensive is accurate.

I think we have that because of the fact that we really fundamentally take pride in what we are doing. We think we are building an excellent system. Unfortunately, the public perception may not exactly coincide with what we believe. I think that once the system becomes operable—I have never heard any one of the 20,000 people that have been on that system so far not get off it with a sense of excitement and enthusiasm—I am confident that once we open it, which will be shortly, and the public has an opportunity to really participate in it and see it and feel it, that they will share the enthusiasm that we have.

Perhaps Commissioner Oesterle, who is really fundamentally an elected person, may wish to respond.

Mrs. OESTERLE. Yes. I would like to say that the news media has been a little bit, I think, overly harsh with us. You can use certain words in releasing a story which has the same meaning, but it doesn't have the impact. In other words, if there was a meeting held between two entities, the news media would tend to say it is a secret meeting, whereas it was a private meeting. There is a difference in the connotations.

Everyone knew the meeting was being held, but it was not a secret meeting. It was a private meeting. These are the type of things, I think, that have been just grossly overexaggerated.

Surely we have had problems. We have had problems when we built the zoo—and I am not comparing building the Metrorail with our building of the zoo. We were literally torn to pieces on a much smaller project building the zoo. Yes; I wear my feelings on my sleeve when it comes to Metrorail; I am very sensitive. I know it is a good system, and I know it is going to carry people and I know it is going to carry them safely, quietly, and well.

I feel that the exaggerations, not just just criticism—just criticism anyone can take without wearing their feelings on their sleeves—but when it comes to total exaggeration of things that happened to Metrorail, we have had more than our share. Just criticism, yes, you can take. But when it is more, then you can't help but feel that you are being put upon.

To go back to the Metro zoo, as I said, we were literally torn apart on that. The day it opened, high praise, total, wonderful praise, in the same media that had torn us apart. We feel it is going to happen when the Dade Metrorail opens. And all of these things, all the criticisms--and we can't help but wear them openly and have our feelings show, because we feel we have been unjustly hurt by the media.

Mr. LEVITAS. The gentleman from Florida.

Mr. LEHMAN. I understand your concern, but you know as well as I do that when we have people in front of us testifying in your hearings in Washington—I know I had the Bureau of Census when I was chairman of the Subcommittee on the Census—and if you think that Mr. Stierheim is defensive, you should have seen the Directors of the Census.

We had the same problem with DOT, whether it is highway safety or whether it is the Secretary of Transportation.

I think that Mr. Stierheim's testimony, in my opinion, has been very open and very candid, has shown a lack of siege mentality that I so often see before my own committee in Washington. So I hope that the chairman will not feel that there is really an overdefensiveness in anything that anyone has said, because the people have been open, candid, and they have told me things I didn't already know.

Mr. LEVITAS. I am not suggesting, nor do I feel, that there has been any attempt to be other than completely open and candid and forthcoming. What I sensed, Bill, was something that three experienced people in the public eye, who constantly subject to criticism, as we all are, seemed in this instance to be—I don't want to say "unnecessarily," because that might be prejudging—but more defensive than some of the people who come before our committee.

People walk in to our committee are invariably defensive, sometimes with good reason, but not always.

Mr. STIERHEIM. It is a condition. It is like Pavlov's dog. It is conditioning.

Mr. LEVITAS. It seems to me that the press is frequently subjected to criticism for many reasons, everything from bias to sensationalism to inaccuracies and incompetency. I am sure that——

Mrs. OESTERLE. I never said that.

Mr. LEVITAS. I am sure all of those things are on some occasions true, and on other occasions they are not. They do a very good job, a very important job in terms of getting information. They are surrogates for the people of this country. But so long as the opportunity to present both sides is there, the public is smart enough to figure out what is right in the last analysis. I was just curious about it.

Mr. Shaw.

Mr. SHAW. Just one further point. My primary source of information here in Dade County is my mother, who is a constituent of these people sitting at the table. And to show the point that you raised, I spent the night at her house last night, and this morning when I left I announced that I was going on a ride on Metrorail. Her comment to me: "Is that safe?"

Mrs. OESTERLE. You see why we are so defensive?

Mr. LEVITAS. I didn't misread it. The gentleman from New York.

Mr. MOLINARI. In fairness to the chairman, I think it should be said that he and I had a conversation and we both came up with the same observation. It appeared to be more than just simply answering the questions. It may have been as a result of the prolonged process. But as one who comes from New York City, where there are a number of major construction projects, all of which are subject to public scrutiny and criticism, with much justification—let me just move on with my questions, if I may.

I would like to get back for a moment to the question of the meetings that you had with UMTA, and I would like to pin that down a little more, if I may.

You had meetings how often? Two-day seminars I think you described.

Mr. HIGGINS. These were established formally, one meeting every 3 months. Usually towards the end of the third month, we exchanged agendas probably 1 week or 10 days before the meeting. We prepared position papers on the items that were going to be on the agenda, and then we met in the Holiday Inn, one of the meeting rooms there. The staffs made presentations on all of the agenda items and there was a discussion following each of the items. We would end the meeting agreeing on a series of open items, issues that UMTA owed us positions on.

The thrust of the entire day was to give UMTA as complete a report as possible on where we were on the project. First of all, moneywise—how much money had we obligated, were we running on line or were we running over or whatever.

Second, we would give them the schedule on every contract as to its complexion.

Third, we would give them a complete report on our MBE program and where we stood on that. They would from time to time

ask for special reports on issues that came to their attention. Maybe they were not happy with some parts of our environmental analysis report or something like that.

Mr. MOLINARI. How about construction problems?

Mr. HIGGINS. Well, they had a separate briefing on construction, and where we were on construction. If we had problems we highlighted those construction problems for them. Then they were taken out on the job itself and taken for a tour.

Mr. MOLINARI. Let's forget about that. I don't mean to be abrupt, but I want to abbreviate the questions so we can complete this panel's testimony. We do know that a great deal of controversy—and we are not going to go into that today—arose with a three volume TSC work, I think it was, that UMTA came up with and your rebuttal, which was ten volumes. Now we are awaiting another expert's report.

I find it difficult in my own mind to understand why it was that at these periodic meetings questions of problems of construction were not discussed in more detail. It seems to me if that had happened it would obviate the necessity for all this work.

Mr. HIGGINS. I think that they were, and I indicated that the bulk of the staff at these meetings was regional people. The first report was based on two FAHWA inspectors coming down and making a quick trip through about 6¼ miles of the line. That was followed up by a group that came down from TSC with, as far as I am concerned, no experience in transit construction.

Mr. MOLINARI. But the question was, or is, was the problem of construction brought up periodically at the time you had these meetings with the UMTA officials, or did these complaints that came forth in the three-volume report——

Mr. HIGGINS. What I am trying to say is that problems were brought up at the meetings. But I think the problems that were quoted by TSC didn't exist in most cases.

Mr. MOLINARI. So that the problems raised by the TSC were not—I am not interested in whether it was something or nothing—but the problems raised by the TSC, were these problems brought up at meetings that you had with UMTA officials?

Mr. HIGGINS. They weren't problems.

Mr. MOLINARI. You are not being responsive. Mr. Stierheim, maybe you can help us. Would you answer the question, please?

Mr. STIERHEIM. I wasn't present during the peer review, but the answer to your question is no. What Mr. Higgins was saying is the bulk of the conclusions of the TSC report we strongly agreed were either nonexistent or being already corrected, or on our punch list.

Mr. MOLINARI. The obvious line of questioning that I am taking is if UMTA didn't raise these questions, why didn't they? They should have, and if they did raise them, and if they were some of the same problems that came forth in that TSC report, then it would have come as no shock and surprise to you. I am not concerned at this point in time whether they were legitimate problems or not legitimate problems, but whether in fact there was a discussion about the construction problems.

Mr. HIGGINS. But since for the most part these were normal punch list type items, we wouldn't bring them up.

Mr. MOLINARI. Were any serious problems raised, any serious construction deficiencies raised in any of these committee discussions that you had with UMTA?

Mr. HIGGINS. The answer is yes. I can remember two particular instances. One goes back several years when we first were making the girders. We had a cracking problem and went through a whole series of actions to try to eliminate cracking, and they were briefed on that very thoroughly.

Mr. MOLINARI. Who raised the questions? That is what I am trying to determine.

Mr. HIGGINS. We had it on our agenda.

Mr. MOLINARI. Did UMTA raise the question at all?

Mr. HIGGINS. Yes; we raised it to them.

Mr. MOLINARI. You raised it?

Mr. HIGGINS. We told them about it and also with respect to the hammerhead pier cap problem.

Mr. MOLINARI. You raised?

Mr. HIGGINS. I raised the question. It was an agenda item and they were briefed on it.

Mr. MOLINARI. So in both cases—the question of girders and the peir caps—these were items that originally were raised by yourself?

Mr. HIGGINS. That is right.

Mr. MOLINARI. Not UMTA?

Mr. HIGGINS. That is right.

Mr. MOLINARI. I think that is a point well worth making.

Let's turn to page 14 of your testimony quickly if we may, Mr. Higgins, where you talk about the reasons why the construction responsibility was taken away from KTG. Your first reason states that construction management activities at this period of time were moving too slowly. You say it was in your judgment due to the design not being complete, and in order to reduce the KTG's responsibilities so they could concentrate on completing the design and review of shop drawings, "I directed MDTA to assume construction management."

In the summer of 1981, it is your testimony that the design of the construction as it was presented to you had not been completed?

Mr. HIGGINS. That is right.

Mr. MOLINARI. Can you tell us when, at what point in time that design was completed?

Mr. HIGGINS. The last station—well, it is hard because even in some cases now we are still touching up on designs.

Mr. MOLINARI. I am talking about the main design.

Mr. HIGGINS. Okeechobee was the last station, and I remember that went about another year after this particular period. I am talking from memory. And also there was continual design action on contracts that were already put on the street, for example, line section 7 had to have——

Mr. MOLINARI. Let me interrupt. You said KTG designed the Okeechobee station?

Mr. HIGGINS. They were responsible for the subcontractor designing it. The only station that they really designed themselves was University, as their pilot station.

Mr. MOLINARI. Their subcontractor in this case was not moving expeditiously?

Mr. HIGGINS. That is right. In fact, if I remember rightly, they even replaced the subcontractor at the station. And then in several instances, we had to put out contracts—line section 7 was an example where design wasn't complete—to keep the sequence going, and then put out a change order to it after the contract was awarded.

Mr. MOLINARI. Now, you mentioned before there was a problem with one of the contractors in building the station?

Mr. HIGGINS. Yes. Fasano.

Mr. MOLINARI. Which station was that?

Mr. HIGGINS. University Station.

Mr. MOLINARI. And that contractor was laid off, was he?

Mr. HIGGINS. That contractor was finally terminated, and he finally went broke, and the bonding company took over the responsibility and rebid the work.

Mr. MOLINARI. They saw that the work was completed?

Mr. HIGGINS. That is correct.

Mr. MOLINARI. How much did Dade County pay KTG for its work on the project?

Mr. HIGGINS. In round figures I would say that their check runs about $118 million now, and our prediction is that before the job is finished it will run about $125 million.

Mr. MOLINARI. Is there any analysis that you have which can show that figure broken down into planning, engineering, and design work on the one hand, and how much was for construction management? How much of the total pay for them is for construction management?

Mr. HIGGINS. I don't have that. I could gather it.

Mr. MOLINARI. Could you furnish that to the subcommittee?

Mr. HIGGINS. Yes, I could.

[The following was submitted for the record:]

TOTAL ACTUAL G.A.E.C. FL-06-0036 EXPENDITURES BY FUNCTION, BY FISCAL YEAR (Dollars in thousands)								PROJECTED AMENDMENT NO.19
FUNCTIONAL AREA	Cumulative through FY ' 78	FY' 79	FY '80	FY '81	FY'82	FY '83	Total Expenditures	FY '84
CONSTRUCTION MANAGEMENT	46	494	2,050	4,030	1,156	166	7,942	1,556
DESIGN-FACILITIES	11,336	14,970	24,632	14,533	7,675	3,518	76,664	706
SYSTEM DESIGN & SUPPORT	1,732	1,616	2,250	2,365	2,276	1,406	11,645	1,357
SYSTEM INSTALLATION	2,250	3,480	2,200	1,207	909	767	10,813	1,006
PLANNING	4,160	654	1,050	634	504	596	7,598	115
QC/QA OVERSIGHT	------	-----	150	156	106	286	698	1,431
TOTALS	19,524	21,214	32,332	22,925	12,626	6,739	*115,360	6,171

*Data Base ending September 30, 1983. An additional approved sum on the order of $1.5 million authorized under the Contract Ceiling was available but had not been paid by MDC as of September 30, 1983.

Mr. MOLINARI. The answer to this question you may also choose to furnish. I have just got a couple more.

How much has the county expended in fulfilling the construction management and quality assurance and control functions?

Mr. HIGGINS. I would have to get that for you.

Mr. MOLINARI. And then the second part of that question would be, has the county saved money by assuming those responsibilities, and if so, can you approximate for the subcommittee how much?

[The following was submitted for the record.]

MDTA assumed responsibility for Construction Management in FY 81. Assuming that KTG had continued as Construction Manager in FY 85, the cost savings realized using conservative assumptions would range from $4.1 to $6.8 million dollars.

The savings realized were a direct result of the elimination of duplication of functions and a more streamlined organizational structure.

As of October 30, 1983 the County has expended $16,889,137 in fulfilling the construction management and quality assurance control functions.

Mr. MOLINARI. Now, to get into the last series of questions that I have. Did Metro-Dade accelerate the original project construction schedule?

Mr. HIGGINS. We were originally scheduled to open the entire line at the end of the summer of 1984. We did accelerate the southern section hoping we could open the first 10 stations or so by December 18 of this year. So that would be about a 6-month acceleration.

Mr. MOLINARI. Can you give me an idea when that was done?

Mr. HIGGINS. About 1 year ago.

Mr. MOLINARI. The last question I have is with respect to the controversy, the time and the funds expended on all these studies and reports and rebuttals. Could much of that have been avoided by closer cooperation between the TSC and Metro-Dade at the time TSC was onsite?

Mr. HIGGINS. Yes, I think it could. For example, when TSC made their report, they did not interview any of the top construction people, including me. They had about a 3-minute exit interview with me that indicated to me things were OK. Now, after they had been out in the field and had talked to the inspectors and the residents, if they had talked to Bill McDaniel and some of the key people, and myself, and even the county manager, I think a lot of it could have been avoided. I think it really was a serious breakdown in communications.

Mr. MOLINARI. By the way, what is the fare, the projected fare?

Mrs. OESTERLE. One dollar.

Mr. MOLINARI. Regardless of to what station?

Mrs. OESTERLE. That is right.

Mr. MOLINARI. What are the projections? You project something like 200——

Mrs. OESTERLE. Two hundred thousand ridership.

Mr. MOLINARI. Daily?

Mrs. OESTERLE. Right.

Mr. MOLINARI. On an annual basis, what is the profit and loss picture? What does it look like?

Mr. STIERHEIM. Of course, it is intermodal and the most expensive form is the buses. That is labor intensive. It costs a lot of money to run buses. The most cost efficient will be the soft rail

downtown component, the next being the heavy rail. The total intermodal system, once we are up and running—and I am picking a figure now of somewhere between $60 and $70 million—we are at $52 now. I would say probably closer to $70.

Mr. MOLINARI. The shortfall you are talking about?

Mr. STIERHEIM. Yes, the support required by the county to operate the system in addition to the Federal support.

Mrs. OESTERLE. That is all systems?

Mr. STIERHEIM. That is all systems, because it is totally intermodal. I would really have to break it out.

Mr. MOLINARI. I take it that the figures that you went over with the chairman before with respect to the bus operation are going to change radically now?

Mr. STIERHEIM. That is correct.

Mr. MOLINARI. Because you are changing the buses. Will fares pay for the bus transportation? Is there a transfer arrangement?

Mrs. OESTERLE. Twenty five cent transfer.

Mr. STIERHEIM. There are monthly passes that will make it attractive for somebody to ride the bus to the rail transit. We haven't set the fare yet for the downtown component. You can ride, for example, on the total system—what is the monthly total transit, $50 or $60?

Mr. HIGGINS. For $60 a month you can ride unlimited on the bus, transit, and so forth.

Mr. STIERHEIM. We think the transit line itself, where it runs north and south and with the tremendous amount of parking—about 13,000 parking spaces—could operate very, very similar to the Lindenwold line, which I believe is getting about 90 or 92 percent out of the fare box. It is the buses that are really costing us the money.

Mr. MOLINARI. I thank you very much. I appreciate your testimony. I have no further questions.

Mr. LEVITAS. Dr. Rowland?

Mr. Shaw?

Mr. SHAW. I would like to pursue a question with regard to the cost. Those figures you gave, I am sure you factored maintenance into the fare. Have you figured in obsolescence and depreciation?

Mr. STIERHEIM. Capital depreciation on equipment? No.

Mr. SHAW. So if that were put in, what do you estimate is the life of this type of transit system?

Mr. HIGGINS. A rail transit vehicle's life by the industry and in bonding is recognized as 40 years.

Mr. SHAW. That would be the cost?

Mr. HIGGINS. If you would amortize or depreciate it, you would depreciate it over a 40-year period of time.

Mr. SHAW. The car that you are paying about $800,000 for, that has a 40-year life?

Mr. HIGGINS. A 40-year life.

Mr. SHAW. Have you looked at this overall system as to what the actual cost is, both the Federal and local share, to put the system in place and run it on a depreciated basis? Has anyone done that, to figure out what it costs all levels of government per passenger mile? Are those figures available anywhere that you know of?

Mr. HIGGINS. I don't know of any studies where depreciation has been cranked into it. It could be done.

Mr. SHAW. You are looking at a billion dollar investment, which is running about a $30 million shortfall on operations alone, without actually factoring in the depreciation and replacement factor, which could be really quite considerable. It certainly ought to be something that the Federal Government ought to get involved in when it is authorizing these new types——

Mr. STIERHEIM. May I respond, Congressman? I spent a lot of time talking about this, because the question that I propound to people is how much do we subsidize the automobile? I don't want to get into this whole philosophical debate, but if you do commission a study on that, I would also like to see the costs, the public investment in right-of-way acquisition, striping, maintenance, construction, landscaping, police, lighting, parking lots, parking garages, the whole 9 yards, which is essential to our automobile economy. And here you have a large segment of the population out there, that can't drive. They are students, they are elderly, they are poor, they are dependent upon public transportation.

I would really like to see a study like that, because I think our whole national planning is off base. I think we should be putting more money into public transportation, for just a whole variety of reasons, but I would like to see that kind of study.

Mr. SHAW. It is a legitimate argument, but I think we make a mistake in our accounting procedures at all levels of government, the municipal governments included. I think one of the problems that we get into as far as wearing out the infrastructure of this country is that we live off the past for a certain length of time without being burdened with such things as depreciation until such time as we get into expenditure. That is how you depreciate, how you work Federal buildings, leasing versus construction in this Nation.

I think our whole way, our whole budgeting system, both at the Federal and local levels, is backwards, and we are losing because of it. We are losing a lot. I think that when we talk about projects such as this, we make the mistake about not analyzing the full financial impact, and all of us at all levels of government go for the program. In doing so, I am afraid we all fall for the common flaw of just taking a look at what it is going to cost our direct constituents, without actually measuring the overall cost and feasibility of these types of systems. Thank you.

Mr. LEVITAS. Thank you very much, Mr. Shaw.

Mr. Nowak.

Mr. NOWAK. I wasn't going to get into that kind of colloquy, but since Mr. Shaw brought it up, I think it is one very important step that I believe you had to take when you started your planning for the system. You can use these figures in almost any fashion you so desire, but you had to do an alternatives study of your system before you were approved, I assume, even to start in the system. You look at public transportation and say what it would cost you to move *x* amount of people *x* amount of miles by bus or by vans or by railroad or by a combination of those. Wasn't that pretty well documented in your initial analyss?

Mrs. OESTERLE. Yes, sir.

Mr. NOWAK. And isn't that an ongoing process for your extension work in the future?

Mrs. OESTERLE. Yes, it is.

Mr. STIERHEIM. Yes, to both questions, and then third, I would say in Dade County at least there was a high degree of public participation, particularly in the south end of the county, where they didn't want it paved over in concrete. They wanted the interestate system stopped where it was stopped, on U.S. Route 1, and then subsequently we had the referendum. I mean, it was not only a sophisticated alternative analysis as required by Federal law, but there was always a high degree of citizen participation in that entire process.

Mr. NOWAK. I think Mr. Shaw is right about talking about the comparison, but I also have been involved with an effort to determine if you take a typical family in a suburban area, build the infrastructure for that home to be serviced, add to the costs of that family the cost of a new car, and the depreciation of that car as it is driven, if 20 cents a mile is a correct deduction.

Avis, I believe, or maybe Hertz, says that it is closer to 60 cents a mile to drive a car. You throw in the parking fees and you throw in the insurance costs and you throw in the total cost of a second car if you don't have public transit, and you probably have added at least several thousand dollars a year in auto-related costs for that family to exist at a certain standard of living. If you look at public transit as an alternative at least for one of those cars, you have cut costs drastically.

Now we are looking at new tax changes, and one of the principal issues that has been raised is whether we take away the auto-related fringe benefits given by an employer to his key employees and which are discriminatory. Should free parking be added to his income every month? And you start to get into all those arguments, and it really becomes necessary to make all kinds of analyses in talking about it.

In developing public policies you have got to get into tax issues. Some of the larger cities that have transit systems would like to let employers pay persons who take public transit $10 a month or $12 a month to take that transit, and let that become a deductible expense in lieu of or paying for parking for his employees.

We have got an awful lot of that that can go into in a survey like that, and I am sure that is going to be part of your next alternative analysis.

Mr. LEVITAS. Thank you, Mr. Nowak.

Mr. Higgins, if you could supply the subcommittee with the criteria, the load criteria on the most recently tested hammerhead pier, and also the description of the test load protocol that was followed in connection with that test, so we could have it in the record.

[The following was received for the record:]

The following is a brief chronology of events concerning pier cap construction and design problems for the North Line Sections of Metrorail.

March 30, 1981—Meeting held between KTG and Wimpey. Wimpey informs KTG he will be requesting modifications to column steel in order to facilitate prefabrication of pier cap reinforcement.

January 29, 1982—DCTA rejects by letter any modifications to column hook configuration.

February 8, 1982—By letter Wimpey informs DCTA of redesign delays due to shop drawing modifications and speaks of possible conflicts between columns and caps.

February 19, 1982—DCTA, by letter approves limited modification of column hooks.

March 4, 1982—By letter Wimpey informs DCTA of problems encountered in meeting 2" clearance for diagonal bars. He believes design is incomplete.

March 12, 1982—Wimpey by letter requests reconsideration on column hook configuration. Wimpey informs DCTA of additional costs due to design modifications.

April 13, 1982—A meeting is held with DCTA/KTG/MDC to discuss problems with Florida Steel rebar shop drawings. Fitzpatrick/Unit Development states that if the direction of the hook bars are outward they interefere with the placing of the column form. Since the specifications call out that the cage be fabricated on the ground to the maximum extent possible. Unit Development feels that the hook bars direction should be inward to allow for cage fabrication.

April 13, 1982—By letter DeFelice files notice of potential claim for design deficiency in that hooked bars projecting from column constitutes an interference between the column verticals and the cage.

May 10, 1982—DCTA directs Wimpey to meet their schedule by increasing their manpower.

May 18, 1982—By letter FHT files notice of potential claim for design deficiency in that hooked bars projecting from column constitutes an interference between the column verticals and the Cage which prevents placement of the cage on the soffit.

June 8, 1982—DeFelice informs DCTA of modifications to column steel thru shop drawing reviews and warns DCTA of additional conflicts between columns and caps.

July 1, 1982—DCTA/KTG/Fitzpatrick/MDC meet to discuss cap modifications. FHT sketches out a proposal to change rebar configuration in the pier cap to enable a partially prefabricated cage to be used. DCTA askes KTG if they have any other ideas, KTG responds No. A further meeting with technical people was scheduled to implement the proposed changes.

July 8, 1982—Wimpey notifies DCTA of their intention to pursue additional time and money from DCTA due to pier cap design not permitting construction according to specified procedures.

July 29, 1982—By letter DCTA transmits Change Notice 65. Change Notice 65 requires the contractor to detail, fabricate and install reinforcing bars in accordance with MDC proposed changes attached to DCTA letter.

August 6, 1982—By letter DCTA transmits to Fitzpatrick Change Notice 46A. Change Notice 46A requires the contractor to detail, fabricate and install reinforcing bars in accordance with MDC proposed changes attached to DCTA letter.

September 15, 1982—CRB authorizes negotiations to take place between Fitzpatrick and DCTA regarding CN 46A.

October 18, 1982—Cap construction resequenced to meet girder erection schedule.

November 11, 1982—Increased pressure for production of pier caps to meet girder schedule. Contractors purchase additional forms.

December 1982—Discussed with KTG the implementation of a hammerhead inspection review team.

February 14, 1983—KTG field review raises concerns regarding pier cap quality. The priorities being given to the bar placement are questionned.

March 20, 1983—Implementation of hammerhead inspection review team begun.

March 11, 1983—Letter from KTG sets priorities for bar placement to resolve conflicts during fabrication.

March 20, 1983—Pier cap teams consisting of KTG and DCTA personnel are instituted to insure greater quality.

April 1983—Herald article appears reporting ledge bars in pier N1956 are mislocated, an investigation reveals bars are properly placed.

June 13, 1983—The decision is made to reinspect all pier caps constructed prior to the institution of pier cap teams, 103 pier caps are identified for reinspection.

July 7, 1983—Reinspection of the pier caps begin.

August 1983—Discrepant caps are located and direction is given to not erect.

September 1983—Reinspection of the caps is completed. Twenty five caps are identified for further investigation. RRJ begins an analysis of the pier caps.

November 1983—RRJ raises concerns with respect to pier cap design and requests a load test program be instituted.

December 1983—A load test program is instituted. Four pier caps are loaded to destruction. All meet design criteria load requirements, but do not fail as predicted.

January 1984—RRJ begins designing a computer model based on the load test findings to analyze the pier cap designs.

RATHS, RATHS & JOHNSON, INC.,
Willowbrook, Ill., November 15, 1983.

Re: Pier Cap Load Testing RRJ 82485.4.

Mr. DAVID POWELL,
Metro-Dade Transportation Administration,
Miami, Fla.

DEAR MR. POWELL: Pursuant to your request please find attached the following items pertinant to the pier cap testing program.

Pier Cap Load Testing Program Outline; Test Procedure; Test Load Target [TLT] Values.

This information should be submitted formally to KTG, M&K, TUDOR and any others interested in the testing program. The material and procedures specifically the TLT deal with the 1st test cap H2598 down station fixed end.

Sample chipping of the 4 diagonals selected for instrumentation at all eight bearings revealed that the most representative bearing would be the down station fixed end one that was found to contain all required reinforcing.

Incomplete results of Radiographic interpretation of the bars not exposed revealed mislocated diagonals in the other bearings and for that reason the selection of the test bearing was made. It is felt that with as designed bar placement, the stressing end bearings would be more critical due to the inboard shift in diagonals and the large stressing pocket. Therefore if the fixed end fails the stressing end should also fail.

Test schedule is targeted for Monday November 21, 1983 and will follow the TLT outline and other data enclosed. Unless I hear to the contrary from any of the interested parties the first test will follow the material contained herein, as scheduled.

Yours truly,

O. C. GUEDELHOEFER, S.E., *Project Manager.*

RATHS, RATHS & JOHNSON, INC.,
November 15, 1983.

PIER CAP LOAD TEST—TEST PROCEDURE

I. SCOPE AND OBJECTIVES

See previous program outline Oct. 26, 1983 by RRJ.

II. EQUIPMENT

A. Jacks

Using the test hardware designed for the pier cap tests as described by RRJ drawings TB–1 thru, 6, a series of 13 hydraulic jacks are positioned as described in the attached Test Load Target [TLT] values to provide certain girder reactions and normal forces.

Five Simplex.—150 ton R 15012 double acting hydraulic jacks with 12 inch stroke are to be supplied to provide Derailment Loading (Group D), Abnormal Service Loading (Group A), and other intermediate load combinations required or described by the TLT values. Maximum load attainable by combining 2–150 ton jacks over the designated ledge girder bearing shall be a nominal 600,000 lbs.

Four Simplex—100 ton (RC1106C) double acting hydraulic jacks with 6 inch stroke are to be supplied to provide counter balancing pier cap reactions on the "non-derailed" girder per the load combination described in the TLT summary.

Four Enerpac.—20 ton (RMC200) flat hydraulic jacks with ½ inch stroke are to be supplied and placed in the space provided between the pier cap and transfer beam to provide the normal force per the TLT summary.

B. Hydraulic console

A console with backflow check values, controle values, and individual 10,000 psi precision gages Marsh Masterflow 100 lb increment or equal, shall be provided with a supply and individual return manifold.

Gages equal to those above shall also be provided on the supply side of the pump between the valves and minifold and the pump.

C. Hydraulic pump

A hydraulic pump with sufficient capacity (35 gal. min.) shall be supplied to activate the hydraulic jacks.

D. Instrumentation

Instrumentation shall be supplied, installed and monitored. The basic instrumentation shall consist of electrical resistance strain gages and optical monitored displacement targets.

1. *Strain gages.*—9 to 12 gages shall be applied 3 at a time to specific groups of vertical, horizontial and diagonal ledge reinforcing. Reinforcing shall be exposed by chipping only enough concrete to expose the bar for proper gage installation. Location of instrumentation shall be established by RRJ.

2. *Monitoring equipment.*—Strain gages shall be monitored by a Vishay P-350 and switch boxes or equal.

3. *Displacement.*—Targets suspended from preselected locations of the test pier cap and ledge shall be optically monitored using standard surveying equipment and accepted survey practices. Accuracy shall be within $\frac{1}{16}$ inch or better. Layout for targets shall be per displacement layout drawing attached. Optical instruments shall be located off the structure and away from the loaded area to avoid disturbance.

4. *Crack widths.*—where practical, safe and accessable, crack widths shall be measured using optical comparators.

III. CALIBRATION

(A) Jacks and gages shall be calibrated providing a traceable force to pressure relationship. The resulting relationship shall be used to establish final reported forces. During testing nominal forces can be used to simplify loading rounding to convenient target and gage pressure increments.

(B) Strain gages shall be calibrated using accepted engineering shunt resisters.

IV. DATA RECORDING

All test data shall be recorded in a ledgable manner identifying the item being monitored, (strain gage, deflection target, or hydraulic gage) load configuration, load stage, time, date, and fraction (where appropriate) of specific design criteria load group. Cracking shall be recorded using suitable engineering sketches and referenced to the load stage. The cracks on the structure shall also be marked where safe.

Photos and Video tape shall be used to record the testing and cracking in addition to the engineering sketches.

V. TEST SEQUENCE

Testing shall be conducted in general agreement with the provisions of ACI-318-77 chapter 20.

The ACI test criteria is based on testing flexural elements in which recovery and rebound is significant. The test procedures contained herein are specifically directed to the ledge behavior. As such as predominant behavior is shear and rebound criteria is not as meaningfull to behavior under derailment loading. Rebound will be measured for the .85 (Group A) loading which will predominatly evaluate the behavior of the cantiliver, not necessarily the behavior of the ledge.

In view of the fact that the greatest concern for the pier cap relates to the cap behavior under derailment loading, the 24 hour hold criteria will be waived as it is a quasi dynamic loading.

(A) Increments shall be per TLT summary.

(B) Hold periods between load stage increments shall be long enough to record and map all cracking and instruments, with a minimum hold of 15 minutes per intermediate load stage.

(C) At major load stages, 1 hr minimum hold periods will be used.

(D) Where appropriate rebound measurements shall be taken.

(E) Testing shall be incrementally increased per the TLT criteria up to failure (refusal of the structure to accept additional applied load) or maximum capacity of the test arrangement.

VI. SAFETY

(A) Safety of test personnel and assistants shall be under the direction of the test engineer. Those not involved directly in the testing shall remain behind the barricade area.

(B) Safety of general public and non-test personnel shall be provided by MDTA.

O. C. GUEDELHOEFER.

RATHS, RATHS & JOHNSON, INC.,
October 26, 1983.

DADE COUNTY METRORAIL, PIER CAP LOAD TESTING PROGRAM OUTLINE

TEST CONCEPT

It is anticipated that a pier cap(s) will be selected for testing that contains known reinforcement locations that, as closely as practical, simulates conditions anticipated to be critical in the balance of the pier cap population. The testing described herein will be conducted to monitor and evaluate performance characteristics of the test ledge(s) of the pier cap so that an analytical evaluation of similar conditions elsewhere in the system can be made with confidence, once critical reinforcement positions are known in the other pier caps. Depending on the range of hypothetical deficiencies and test results, more than one test may be required to fully quantify the validity and conservancy of proposed analytical techniques.

Since the behavior of the ledge is of primary interest it is desirable to use the tests to demonstrate the interrelationship of not only the principal ledge reinforcing consisting of vertical, horizontal and diagonal reinforcement, but also the lateral load transfer behavior of the heavily loaded ledge under derailment loading. Due to continuity of the ledge, inboard derailment is not expected to be as critical if equivalently reinforced, than the outboard ledge, which terminates near the outer edge of the girder stem and therefore doesn't have any lateral load transfer ability to the outboard.

To establish the lateral distribution of ledge reactions, electrical resistance strain gages will be used. It is anticipated that gages will be used three at a time in groups to monitor vertical, horizontal and diagonal reinforcement strains at three to four cap cross sections. Sections instrumented will be those most inboard and outboard sections containing diagonal bars at each of the two girder bearing locations per ledge tested. This should allow determination of both lateral reaction distribution along the ledge due to either derailment (high single reaction loading) and factored service (Group A) loading.

Additional instrumentation includes optically monitored targets mounted on top of the cap stem to establish pier cap behavior and beneath the ledge to monitor ledge behavior after cracking. Crack widths will be monitored, marked, and recorded at each load stage.

Loading will be accomplished using test hardware designed to interact with hydraulic jacks manifolded individually or in groups to provide the desired cap ledge test loadings thru a special transfer beam. See RRJ drawings TB 1 thru 6. The design of the transfer beam is such that accommodations for the anchor bolt, longitudinal force and limited rotation are provided for the addition if the outboard corner of the cap were to fail and drop, the continuous bottom plate of the transfer beam will come to rest on the remaining ledge in a manner similar to the actual girders, allowing an evaluation of ultimate performance in a post failure scenerio.

The hydraulic system will react against either dead load ballast or soil/rock anchors set in the underlying sub strata.

It is contemplated that loading will be applied incrementally. The first increment will represent girder selfweight and be followed by pier cap second stage post-tensioning. Following this additional test increments will be applied up to failure or max. factored capacity which ever occurs first. The anticipated load cases will follow both service and factored critical or maximum ledge load groups for both the Tee and Box criteria on Box ledges and Tee only criteria on a Tee ledge. Both Modified (GROUP D*) and original (GROUP D) derailment criteria are anticipated. The approximate maximum loading for a Box ledge would be the following with intermediate increments.

Load group	Factored	Maximum load (lbs)
Group I—Abnormal service-tee	Unfactored	137,800
Group I—Abnormal service-box	do	176,900
Group D*—Modern derailment tee	Factored	198,600
Group A—Abnormal service tee	do	234,300
Group A—Abnormal service box	do	322,300
Group D*—Modified derailment box	do	332,400
Group D—Derailment tee	do	
Group D—Derailment Box	do	

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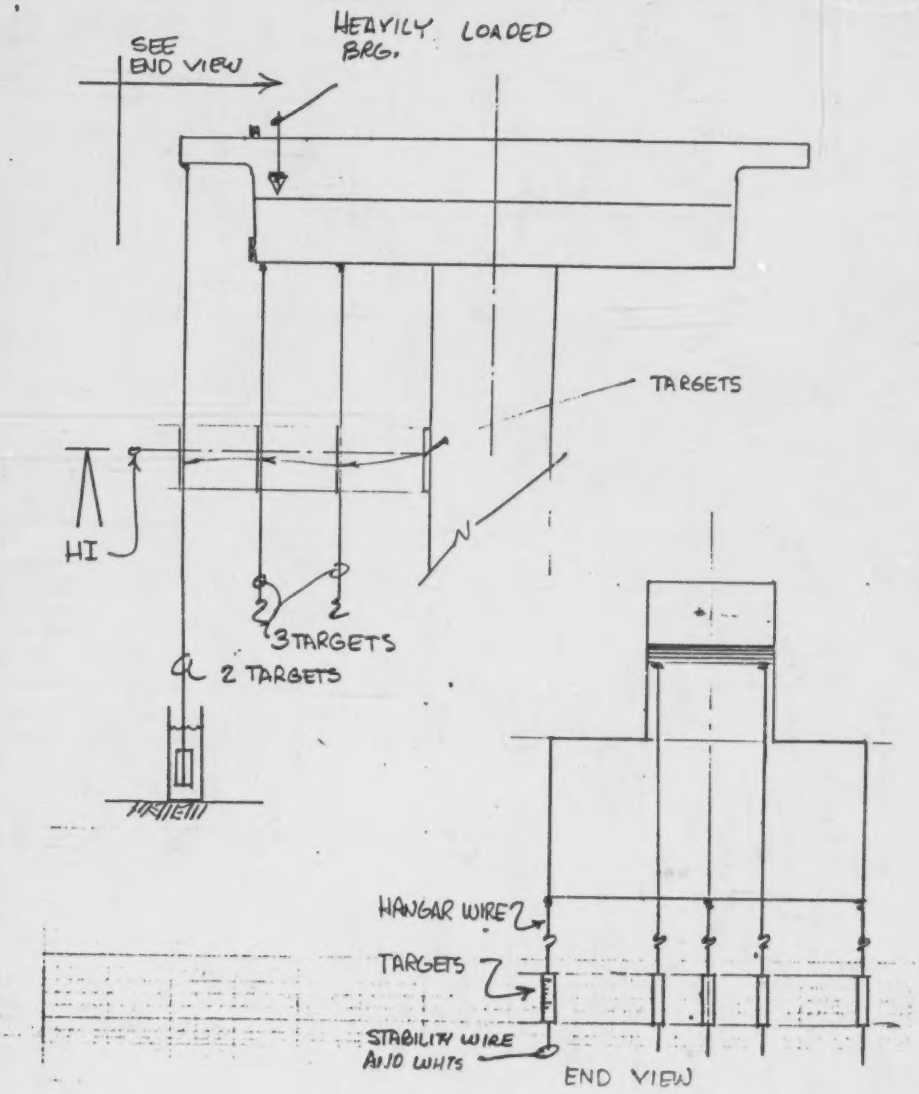
PRINCIPAL TEST OBJECTIVES

1. To establish the lateral distribution of effective ledge to resist outboard and inboard reactions.
2. To establish the stress levels in basic ledge reinforcing as a function of applied ledge loads.
3. To establish the cracking of ledge as a function of applied ledge loads.
4. To establish the capacity of the ledge to applied ledge loadings.
5. To confirm by chipping the bar locations predicted by previous chipping and other list methods.

RATHS, RATHS & JOHNSON, INC. STRUCTURAL ENGINEERS 835 Midway Drive, Willowbrook, Illinois 60521			DEFLECTION INSTRUMENTATION PIER CAP TESTING H2598 FIXED END DN. STA	SHEET NUMBER 1 of 1
MADE BY CCG	DATE 11-15-83	CHECKED BY		JOB NUMBER 82488.0



RATHS, RATHS & JOHNSON, INC. STRUCTURAL ENGINEERS 835 Midway Drive, Willowbrook, Illinois 60521			DADE COUNTY METRO PIER CAP LOAD TEST LOAD FOR H2598 (TT)	SHEET NUMBER	
MADE BY	DATE	CHECKED BY		JOB NUMBER	
ATK	11-15-83			82485	

TEST LOAD TARGET VALUES
TLT TABLE
TEST 1 H2598 FIX END DOWN STATION

	INBOUND (FIXED)												OUTBOUND (STRESSING)											
	(SE) SPAN 1 (BACK)				SPAN 2 (AHEAD)				"N"				SPAN 1 (BACK)				SPAN 2 (AHEAD)				N			
	OB		IB		OB		IB		SPAN 1		SPAN 2		OB		IB		OB		IB		SPAN 1		SPAN 2	
	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE A=	LOAD	PRESSURE
DL + SDL (OB MAX)	68.9		58.3		68.2		57.7		10.		0		68.9		58.3		68.2		57.7		0		0	
GROUP I	135.1		108.6		89.2		70.0		5.4		-2.2		"		"		"		"		"		"	
.85 × GROUP A	198.3		157.3		104.8		86.5		9.9		-1.0		"		"		"		"		"		"	
GROUP D**	214.0		62.2		103.9		79.5		7.6		-3.0		"		"		"		"		"		"	
GROUP A	233.3		185.1		123.3		101.8		11.7		-1.7		"		"		"		"		"		"	
DL + SDL (OB MAX)	68.9		58.3		68.2		57.7		0		0		"		"		"		"		"		"	
.5 "D"	185.1		12.6		65.8		30.6		3.8		-1.5		"		"		"		"		"		"	
.75 "D"	277.6		18.9		98.6		45.9		5.7		-2.3		"		"		"		"		"		"	
.85 "D"	314.6		21.4		111.8		52.0		6.5		-2.6		"		"		"		"		"		"	
100% "D"	370.1		25.2		131.5		61.2		7.6		-3.0		"		"		"		"		"		"	
	400		25.2		161.4		61.2		0		0		"		"		"		"		"		"	
	450		25.2		211.4		61.2		0		0		"		"		"		"		"		"	
	500		25.2		261.4		61.2		0		0		"		"		"		"		"		"	
	550		25.2		311.4		61.2		0		0		"		"		"		"		"		"	

[Memo to file 82485.4]

RATHS, RATHS & JOHNSON, Inc.

Date: December 16, 1983,
From: O. C. Guedelhoefer
Re: Pier Cap Status
To: Dave Powell.

Pursuant to conversations and discussions of the previous two and a half days, this memo is being written to clarify some of the more salient facts to avoid confusion and convey the intent of our opinions.

(1) Full scale testing conducted thus far has resulted in the following preliminary general results that are tabulated below:

BASIC PRELIMINARY RESULTS

Loading		TT Cap H2598			BT Cap H2589		
Group	Impact (percent)	Load 1,000 lbs.	Stress KSI	Crack width inches	Load 1,000 lbs.	Stress KSI	Crack width inches
Unfactored operational I	30	136	11.2	.010	176	30.1	.009
Factored operational A	30	232.5	29.3	.025	301	64	.038
Unfactored derailment IV	100	291	31	.030	384	67	.050
Unfactored derailment IV	0	180	18	.008	242	46	.030
Factored derailment 0.85D	100		41	.040			.050/.050
Factored derailment D	100	372	Y	.070	485	Y	.100/.050
Failure		501		.175	544		

(2) The testing established a different mode of ledge behavior and failure than expected resulting in much less distribution of load directly back to body of cap. Ledge crack length was about 17 to 22 inches for the T and B respectively.

(3) The test results must be developed into a general theory that can be applied to similar ledges to evaluate their capacity and behavior once reinforcing and other factors are known for each ledge to be evaluated.

(4) Radiographic work must be conducted to establish critical bar locations for input into the general theory, and analyzed prior to any determination of ledge acceptability.

(5) A review of shop drawings will allow a first look at the impact that the smaller distribution has on general ledge behavior. Step 4 could result in less capacity that previously suspected and necessitate need for repairs.

(6) A careful review of the high stresses resulting from group IV on the B ledge must be made. Initial indications are that these would result in more damage as a result of specified severe derailment that was found in the T ledge.

(7) In view of the behavior of the ledges less complex and extensive repairs now appear feasible.

The target date provided by this office of Jan. 23, 1984 was to include a decision as to which south line ledges would not require repair, which would require repair, and what forms of repair would be appropriate. The design and detailing of the repair would be by TUDOR/KTG using input and recommendations made by RRJ. Depending on TUDOR/KTG schedule these repairs will be reviewed if time permits. It must be realized that approximately one week is required to review a family of similar repairs dependant on complexity of the repair.

Those activities that RRJ can exercise reasonable control over reading schedules inlcude: Radiography, Technical performance of load testing, analytical review of test data and application of test results to specific piers.

Aspects of Radiography that are beyond our control and directly impact schedule include, coordination of hole drilling and hole drilling itself, coordination of traffic maintenance, coordination of track allocation—shutting off 3rd rail. These function are all under the control of the County and must be closely coordinated by them. The only remaining item impacting schedule is the shot times and number of shots. Initial estimates for time were based on the radiographers experience with the narrower TT caps of about 10 to 12 hrs per cap. Current experience on the wider BT caps indicate completion rates of 2 days per cap The new standard 5 ft. wide caps such as Snapper Creek and $5400 will require grater exposure times. Using these estimates and barring any coordination problems or delays the proposed minimum radiography work requires two crew days. Working Saturdays and extended hours

with a start of Tuesday, Dec. 26 indicates completion of radiography of the eight on Jan. 20, 1983. Anticipating the week required by RRJ to review the last radiograph and allowing 2 days slip due to coordination difficulties, rain etc. slips the Jan. 23 date to Jan. 30. RRJ believes this new date is optimistic, but we will do everything in our control to meet it.

You should recall that on Nov. 3, 1983 we advised the County and KTG that our review of the South line revealed 11 ledge conditions which would not satisfy original criteria if built per plans. Of those, 4 contained reinforcement 33 percent below the amounts RRJ believed were necessary to satisfy the design criteria and two (Snapper Creek) were suspect baised on unexpectedly wide cracking. It was our belief that the load testing would demonstrate greater ledge distribution and those 5 caps with 20 to 25 percent deficiencies would be acceptable and possibly even the 4 would exhibit satisfactory behavior. Since the behavior was not as expected, a rereview is neccessary and currently under way.

In anticipation of the desire to not loose time should a repair ultimately become neccessary, our recommendation today remains the same as in Nov., move foreward with repair designs for the six. The test results however allow a better repair option, namely the possibility of a less complex repair and we believe that this should be pursued prior to a repair go ahead.

Should you have any questions please contact me.

Yours truly,

O. C. GUEDELHOEFER, *Project Manager.*

[Memorandum]

To: M. R. Stierheim, County Manager.
From O. C. Guedelhoefer.
Date: December 23, 1983.
Subject: Pier Cap Investigation.

Results of the third Pier Cap load test just completed yesterday in Hialeah were more favorable than expected.

Test loads were applied to the opposite end of the first cap tested to evaluate the behavior of the "stressing end" of a TT type cap. Because of differences in the intended reinforcing the stressing end was expected to yield lower capacities than the opposite end of the cap.

The maximum capacity attained was about 420,000 lbs which exceeded the capacity required for that particular cap by about 50,000 lbs, and was about equal to the capacity required on the few similar caps designed to carry the heavier type 3 girders.

Barring significant construction deficiencies that will be examined using radiographic methods the results are very encouraging for this family of pier caps.

RATHS, RATHS & JOHNSON, INC.,
Willowbrook, Ill., January 5, 1984.

Re: MDTA Girder Y131, QC Summary, RRJ 82485.

Mr. WARREN J. HIGGINS,
Metropolitan Dade County, Transportation Administration, Miami, Fla.

GENTLEMEN: Pursuant to your request please find the following abbreviated descriptive summary of the QC program in use during the Y131 Precast Prestressed Double Tee Girder production. Information provided in this summary is based on interviews of responsible personnel present during the girder production period and observations made by this writer.

Production of the Y131 precast prestressed double tee guideway girders began in August, 1980 with the fabrication of the standard girders and continued throughout the next 2½ years until the end of January 1983 when all 2333 girders were completed. Initially there was in place a redundant Quality Control [QC] operation wherein the Contractor provided Quality Control consistant with the terms of his contract and MDTA/KTG also provided similar detailed Quality Control functions. The term redundant is used because both groups maintained independent but similar quality control reconds in some cases.

The basic quality control plan, procedures and requirements were built around the PCI-MNL-116-77 document entitled "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products" which is an industry standard for prestressed plants. These procedures etc. are detailed in the document

prepared by RT Joint Venture entitled "Operations and Quality Control Manual for Production and Erection of Prestressed Concrete Girders for MDC Contract Y131"—Feb. 26, 1980 (Manual). The Manual was approved by MDTA/KTG and was in force during production. The concept, approach, and procedures as described in the Manual dealing with those aspects reviewed, namely girder production, appear adequate for the purpose intended.

In addition to the quality control functions undertaken by RT and KTG/MDTA various local materials testing laboratories were engaged to independently sample, test and report the concrete and other materials used on the project.

Based on the approach to QC outlined in the Contractors QC Manual an integrated approach was undertaken in regards to the QC documentation. The basic documents generated, included the items shown in Table 1 with the organization creating the document listed to the right in the Table.

During girder production on June 1, 1981, a transition in management replaced KTG inspectors with MDTA personnel for in plant girder surveillance. This transition was accomplished by November 16, 1981. This change was accompanied by a reduction in the number of non-Contractor, County, inspectors and a change in scope from detailed to periodic checking of production items. During surveillance provided by both KTG and MDTA inspector manpower levels started high and reduced as the job progressed. During the entire period the contractor was responsible for production Quality Control pursuant to the terms of his contract and his level of inspection remaned effectively the same. The documentation required of the Contractor during surveillance remained about the same throughout.

Although elements of the MDTA Quality Assurance program did audit the girder production as part of their formal program in December, 1981, a specific formal Quality Assurance program for girder production was not required and was not in place during girder production. Realistically the reduced MDTA in plant personnel, after November, 1981 provided more a function of quality assurance on a periodic basis than a strict QC function. Prior to November the larger KTG in plant staff had provided a redundant quality control function.

As a result of the translation in November, 1981, it is evident in the production record audit that certain KTG activities were either omitted or periodically checked and as a consequence some associated records were not maintained for all girders produced. Essential records such as prestress elongations and jacking and concrete strengths and others RT was responsible for, were maintained by the contractor for all girders produced.

Yours truly,

RATHS, RATHS & JOHNSON, INC.
O. C. GUEDELHOEFER, *Project Manager.*

TABLE 1.—QC DOCUMENT LIST

	RT	KTG	MDTA
A. Pre pour check list (1st and 2d pours)		X	Periodic.
B. Prestress and elongation	X		
C. Post pour check list (1st and 2d pours)	[1]X	X	X.
D. Concrete compressive strength reports (1st and 2d pours)	Release	28 day	28 day.
E. Concrete placing records (1st and 2d pours)		X	Periodic.
F. Critical dimensions summary sheet	[1]X		
G. Post pour inspection report	[1]X	X	Periodic.
H. Crack survey	X		
I. Girder repair inspection report	X		X.
J. Production history log (1st and 2d pours)	Computer	X	Periodic.
K. Batch plant mix (1st and 2d pours)	X		
L. Mill test reinforcing steel certificate	X		
M. Temperature for steam cure	X		

[1] Post pour data developed by RT served several functions.

Mr. LEVITAS. We are about to take a break. The reporter, I know, will be very appreciative of that.

I have some announcements to make before we do, but before I make those announcements, I would like to express my apprecia-

tion to the three of you, Mrs. Oesterle, Mr. Stierheim, and Mr. Higgins, for your testimony, as well as the others on your respective staffs who have participated in the hearing this morning and this afternoon. I know that I have learned a great deal since I have arrived in Miami, and during the course of the hearings today, and as we reflect over this testimony, I am sure that we will all learn a great deal more.

I want to announce that the record will be kept open for three weeks in order to receive written statements from any interested party wishing to make a statement for the record. We have a statement that will be made a part of the record from Mr. Gene E. Carroll, Director of the Office of Management and Technical Assistance, Southern Region of Urban Mass Transit Administration. Executive summaries of the TSC report and the county documents likewise will be placed in the record.

I will state this later in the day, but as I previously indicated, we intend to have further hearings on this subject, and to receive material on various aspects of this situation which we cannot cover today. For example, KTG and other witnesses may be heard or certainly encouraged to add to the Record in order to flesh out the picture. But I think we have made tremendous progress in our efforts, and a great deal of credit goes to the three of you.

It is now my intention to ask that the committee stand in recess for 30 minutes, at which time we will reconvene and receive testimony from the witnesses from the Urban Mass Transportation Administration and then, finally, from Mr. W. Kent Larsen, of the Morrison-Knudsen Construction Co.

Thank you very much.

The subcommittee stands in recess.

[A short recess was taken.]

[The following were received for the record:]

STATEMENT PREPARED FOR THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION HEARING IN MIAMI, FLA., DECEMBER 13, 1983, BY GENE E. CARROLL, UMTA REGION IV

Mr. Chairman, I appreciate the opportunity to appear before this Committee. I am the Director of the Office of Management and Technical Assistance (formerly the project Management Division), in UMTA Region IV, Atlanta.

My background is as follows: I have worked for UMTA for 5 years, all in project management. Prior to that, I worked at MARTA in Atlanta for 5 years in three jobs: "Program Control," which includes budget, schedule, and cost estimating; "Design and Engineering," involving procurement of design of MARTA's line and stations; and "Rail Activation," which involved the procurement and installation of the systems and equipment for start-up of the rail system.

Prior to that, I served 21 years in the U.S. Air Force, the last 10 of which as an Engineer involved in the design, procurement, testing, and putting into operation of complex systems.

Region IV, where I work, is the UMTA Regional Office for the 8 Southeastern states and Puerto Rico. The Region has about 67 transit operator grantees, about 75 planning grantees, makes over 300 grants annually, for a total amount of about $300 million annually.

The Region has a staff of about 21 persons; 12 managerial or professional, and 9 clerical or para-professional.

My office (or division) is responsible for managing grants after they are made. This involves a long list of functions with which I won't bore you now, but generally managing grants means monitoring and evaluating performance, assuring Federal requirements are met, paying the grantees, and reviewing and approving those actions requiring Federal approval, such as contracts, bid protests, property disposition, etc. Our active major projects include both the Miami Metrorail and Metro-

mover [DPM], as well as the MARTA Rail System. In my division, I have 3 professionals, one para-professional, and one clerical. Our primary management emphasis is on assuring that Federal requirements are followed during project implementation, and that the project is properly implemented in a timely and cost effective manner. The Office is currently responsible for the management of approximately 800 active grants.

For major projects such as Metrorail, due to our limited personnel, UMTA has, of necessity, developed special management techniques, the primary ones being the use of quarterly project management meetings and the use of "Full Funded Contracts."

These quarterly project management meetings with Dade County staff are attended by all disciplines within the UMTA staff that are appropriate for the issues to be discussed, e.g. engineering, planning, legal, grant making, etc. Issues are brought up for discussion at these meetings by both UMTA and the grantee, based upon perceived need, although a standard set of subjects are regularly addressed, such as status of design, cost projections, and construction progress.

The Full Funding Contract [FFC] is a contract between UMTA and the grantee whereby the grantee is committed to completing the project with a maximum amount of Federal funds. In return, UMTA's day-to-day involvement in the project is reduced by giving the grantee much more autonomy in decision making and reduced reporting. Metrorail has a Full Funding Contract, drafted in early 1979, and signed May 1980. The Full Funding Contract places maximum incentive upon the grantee to control costs, since cost overruns are paid for 100% by the grantee.

Since the Full Funding Contract, our management process has concentrated primarily upon monitoring Dade County's adherence to specific Federal requirements, budget and schedule, assuring allowability of project costs and maintaining an awareness of reasons for cost variances.

Our degree of involvement in Dade County's construction management process had been very limited prior to the issuance of the DOT–OIG report on Metrorail construction in February 1983, consisting primarily of review and approval of their written plan and procedures for construction management. As a result of the DOT–OIG report and a subsequent evaluation primarily performed by the Transportation Systems Center, Cambridge, Massachusetts, and Dade County's response thereto, we have now increased significantly our monitoring of Dade County's construction management, quality control and quality assurance processes through the engagement of a special construction management consultant, Morrison-Knudsen. Morrison-Knudsen's scope of work essentially involves the monitoring and evaluation of Dade County's identification and correction of any defective construction on Metrorail. They also will monitor and evaluate on-going and future construction. Morrison-Knudsen reports to UMTA through the Regional Office. They currently have a staff of 8 highly qualified and experienced engineers and quality assurance personnel in Miami performing their scope of work.

This completes my prepared statement.

EDITORIAL NOTE: The lengthy TSC report (3 volumes) and the even longer Metropolitan Dade County response (10 volumes) are retained in the Subcommittee files. The initial pages of each report, including executive summaries, are included at this point to provide a summarized version of the substance of each set of documents. A copy of the Metro-Dade Quality Policy Manual also is retained in the Subcommittee files.

TRANSPORTATION SYSTEMS CENTER DOCUMENT

TECHNICAL ASSESSMENT OF THE METRORAIL CONSTRUCTION PROJECT OF THE DADE COUNTY TRANSPORTATION ADMINISTRATION

FOREWORD

This report presents the findings, conclusions and recommendations of the Task Force formed at the request of the Administrator of the Urban Mass Transportation Administration [UMTA] to conduct a technical assessment of the Metrorail construction project. The report is based on the physical testing of selected structures to assess the quality of work-in-place and an on-site review of construction management procedures.

The Task Force consisted of engineers from the Transportation Systems Center [TSC], UMTA, and the Federal Highway Administration [FHWA]. Staff from the Office of Inspector General provided substantial documentation collected during the

course of its investigation. The Task Force was supported by technical experts from industry and academia.

Mr. Merrett Stierheim, Dade County Manager, insured the total and complete access to material and personnel in Miami. Mr. Herbert Priluck, the Dade County Liaison to the Task Force, with the assistance of Mr. Jack Crognale, helped Task Force members by arranging interviews with appropriate Dade County Transportation Administration [DCTA] personnel, providing documents and data and assisting in the test program logistics. Interviews were also conducted with other individuals who are now or have in the past been associated with the design and construction of the METRORAIL system. The help and cooperation of all these individuals is appreciated.

Dr. James Costantino. TSC Director, gave valuable advice throughout the study and along with Dr. Richard John, TSC Chief Scientist, and Philip Coonley, Special Assistant to the Director, provided many useful comments and suggestions during the preparation of this report. We are grateful to Alice Grant, Dilcy Garro, and Amy Natale for all their efforts in support of the study.

The support of UMTA Administrator, Arthur E. Teele, Jr., and UMTA Executive Director, Raymond J. Sander, during the conduct of this study is also appreciated.

ROBERT J. RAVERA, *Deputy Director,*
Transportation Systems Center.

TASK FORCE MEMBERS

Dr. Robert J. Ravera, Deputy Director, Transportation Systems Center [TSC], (Task Force Manager).

Dr. Thomas N. Harvey, Associate Director for Research and Analysis, TSC.

Santo J. Gozzo, Maintenance and Productivity Division, TSC.

Lawrence P. Silva, Maintenance and Productivity Division, TSC.

James Hoblitzell, Bridge Division, Federal Highway Administration.

Walter Dougherty, Program Guidance Division, Urban Mass Transportation Administration.

Adelbert L. Lavery, Chief, Safety and Security Division, TSC.

Andrew Sluz, Construction Technology Division, TSC.

Phillip A. Mattson, Construction Technology Division, TSC.

Dr. Pin Tong, Chief, Structures and Dynamics Division, TSC.

Howard Evoy, Project Management Division, Urban Mass Transportation Administration.

Executive summary

On March 28, 1983, the Transportation Systems Center [TSC] organized a Task Force for the Urban Mass Transportation Administration [UMTA] for the purpose of conducting a technical assessment of the METRORAIL construction project of the Dade County (Miami, FL) Transportation Administration. The impetus for this request was a report dated February 9, 1983, prepared by engineers from the Florida Division of the Federal Highway Administration [FHWA] for the Office of Inspector General [OIG] of the Department of Transportation. This OIG report, which focused on four distinct line contract sections representing about 6.5 miles of the proposed 20.5-mile system, stated that "A significant amount of the work is not being performed in compliance with the requirements of the contract documents".

The Task Force conducted an independent technical assessment having the following objectives:

Assess the quality of work-in-place of selected structural components relative to their design specifications.

Assess the Metrorail construction management processes, with emphasis on quality control and quality assurance.

The Task Force was composed of engineers from TSC, UMTA, and FHWA supported by outside experts from industry and academia in the areas of on-site construction management, quality assurance, structural testing of reinforced concrete and structural analysis.

The thirty-day time constraint for field testing did not permit a systemwide assessment of the quality of work-in-place for the 7,078 individual structural components. Special emphasis was placed on an assessment of problem areas cited in the OIG report. A number of other reported deficiencies which surfaced during the course of the study were also addressed.

The impact of construction deficiencies on the overall system safety of metrorail is not assessable solely on the basis of this study because system safety is a function of the many other major system elements, including structural design, vehicle speci-

fication, operating procedures and maintenance. Therefore, no conclusion is provided relative to the safety implications of the observed condition of as-built structures.

General conclusions

A majority of the fifty-six structural components tested were not constructed in full compliance with contract documents; in some instances, the deficiencies require extensive corrective measures.

Deficiencies found in structural components can be corrected. If not corrected according to applicable industry standards, these deficiencies will reduce the load-bearing capacity and/or the service life of the guideway.

Based on tests, analyses and review of construction records, it is likely that construction not in substantial compliance with contract documents exists elsewhere in the system.

Metrorail Quality Assurance and Quality Control procedures as prescribed were adequate to insure quality construction; however, the prescribed procedures and methods were not adequately implemented by DCTA.

Specific conclusions

Quality of work-in-place

Tests on foundations revealed instances of deficient consolidation of concrete, presence of cold joints and internal voids, and inadequate construction practices in the presence of ground water flow. Construction records reviewed indicate instances of misplaced and missing piles, and piles with less than specified bearing capacity.

Piers examined on the Northline exhibit extensive areas of honeycombing, improper formwork and reinforcement location, deficient concrete consolidation and washout of concrete in areas of ground water intrusion. On the Southline, piers subjected to more limited examination appear to be of comparable construction quality.

Based on physical examinations and nondestructive tests of seven hammerhead pier caps, all exhibited deficient consolidation of concrete and/or mislocation of reinforcing steel and cracks.

According to construction records, there was inadequate monitoring to assure that the critical prestress procedures were followed in the fabrication of girders. Also, existence of defects in end diaphragms of girders was confirmed.

Concrete core samples tested generally exceeded compressive strength specifications; however, ultimate structural performance has been diminished in some cases by the identified construction deficiencies.

Quality assurance and quality control

Field Inspectors did not have the assigned authority, training equipment, and logistical support needed to properly carry out the quality control function.

Construction records examined were often incomplete, inaccurate and not readily retrievable.

No individual was assigned the function of ensuring compliance with construction quality assurance requirements.

Recommendations

DCTA should immediately strengthen its Quality Assurance and Quality Control programs for the remaining construction, as well as during the performance of necessary corrective actions.

DCTA should initiate corrective action on all identified deficiencies and initiate a program to identify and correct other deficiencies. All repairs should be in accordance with applicable industry standards.

DCTA should develop and implement a comprehensive long-term technical monitoring program for selected structural elements to identify any degradation of long-bearing capacity and service life.

UMTA should require Quality Assurance and Quality Control plans for major capital assistance grants and oversee their implementation.

INTRODUCTION

On March 28, 1983, the Transportation Systems Center [TSC] organized a Task Force at the request of the Administrator, Urban Mass Transportation Administration [UMTA], to conduct a technical assessment of the METRORAIL Construction Project. The impetus for this request was a report dated February 9, 1983, prepared by engineers from the Florida Division of the Federal Highway Administration [FHWA] for the Office of the Inspector General [OIG] of the Department of Transportation [DOT]. This OIG report, which focused on four distinct line contract sections representing about 6.5 miles of the proposed 20.5-mile system, stated that "A

significant amount of work is not being performed in compliance with the requirements of the contract documents".

The Task Force conducted an independent technical assessment having the following principal objectives:

Assess the construction quality of selected structural components relative to their design specifications.

Assess the METRORAIL construction management processes, with emphasis on quality control and quality assurance.

An important secondary objective was to draw conclusions concerning the impact of any observed deficiencies on load-bearing capacity and service life.

The thirty-day time constraint for field testing did not permit a systemwide assessment of the quality of work-in-place for the 7,078 individual structural components. Special emphasis was placed on an assessment of problem areas cited in the OIG report. A limited sampling of construction sites at line segments not previously reviewed was, however, conducted. A number of other reported deficiencies which surfaced during the course of the study were also addressed. Those structural elements requiring excavation or destruction of work-in-place for inspection by necessity received more limited treatment.

The impact of construction deficiencies on the overall system safety of METRORAIL is not assessable solely on the basis of this study because system safety is a function of the many other major system elements, including structual design, vehicle specification, operating procedures and maintenance. Therefore, no conclusion is provided relative to the safety implications of the observed condition of as-built structures.

Interviews were conducted with individuals who are now or have in the past been associated with the design and contruction of the Metrorail system. In some instances, contradictory views were expressed regarding specific events, and differing opinions were offered on the issue of the degree of importance to be attached to the observed as-built condition of certain structures compared to original design specifications and whether this had any impact on structural integrity. The conclusions presented in this report, however, are based solely on the investigations, tests, and analyses of the Task Force.

BACKGROUND

This assessment focused on the Metrorail Stage I system having twenty stations and 20.5 miles of elevated guideway. A system map is shown in Figure 2-1. The location of major line segment contracts (by number) is also shown in Figure 2-1. Table 2.1 lists the prime Metrorail line contractors, their respective contract section numbers and dollar level of activity. Table 2.2 gives a breakdown of the 7,078 primary structural components contained in the system.

Visual inspection of the line reveals an architecturally attractive structure, embodying unique design features to create a low-profile, unobtrusive elevated guideway. Most of the major structural components are either reinforced cast-in-place concrete or prestressed, precast concrete. Some of the structures containing unique design features are new to heavy rail transit aplications. These unique architectural features are not ideal from an ease-of-construction viewpoint. Thus, fabrication and erection of these structures to meet design goals require quality construction performance.

The responsible authority for the Metrorail system is the Dade County Transportation Administration [DCTA]. DCTA's system engineer since the inception of the project in 1976 has been the Kaiser Transit Group [KTG], a joint venture consisting of the following firms: Kaiser Engineers, Harry Weese & Associates, Ltd., Post Buckley, Schuh & Jernigan, Inc., Carr Smith and Associates, Inc., and Schimpeler-Corradino, PSC.

Prior to June, 1981, KTG was responsible for design and construction management (including quality assurance and inspection); since then, their role has been limited to design, and DCTA has assumed responsibility for construction management. A chronology of significant Metrorail events is shown in Table 2.3.

At this point, line construction south of the Miami River (Southline) is nearly complete while the Northline is about 90% complete. Whereas the OIG report concentrated only on line section contracts N-105, N-205, N-215 and N-315 (all Northline segments), this assessment included other line segments along the North and South lines as well as the girder fabrication yard.

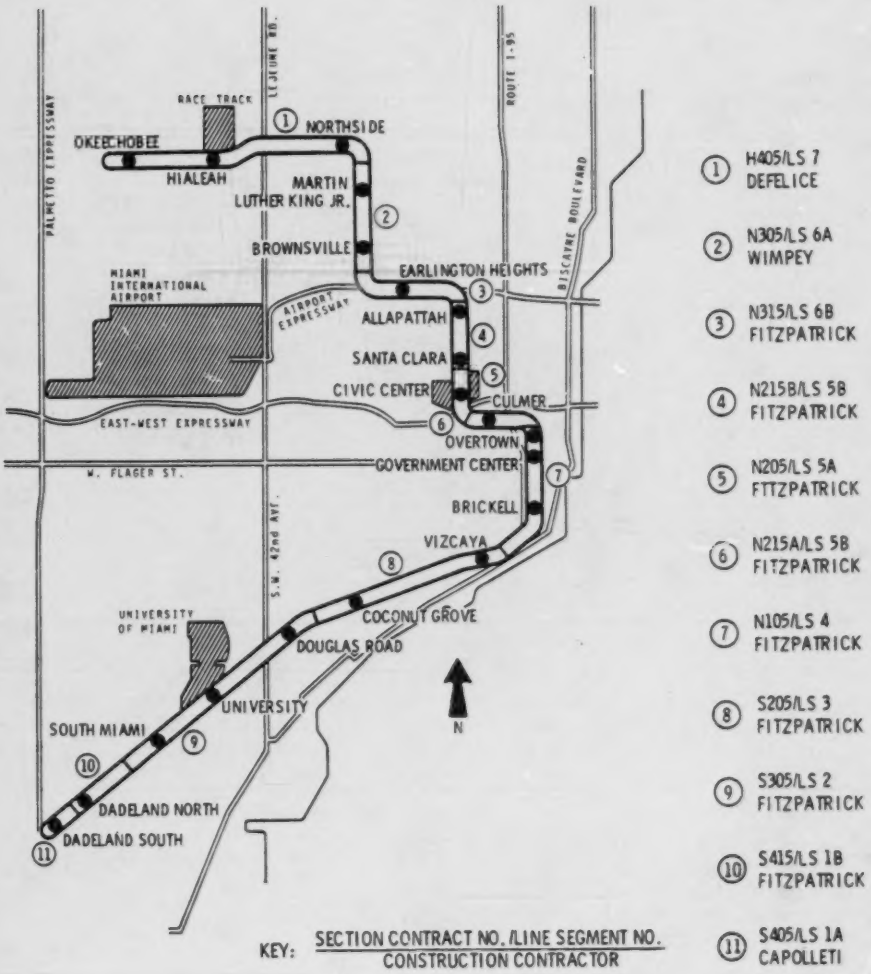


FIGURE 2-1. DADE COUNTY METRORAIL

TABLE 2.1.—METRORAIL LINE CONTRACTORS

[Part A—General]

Contract No.	Description	Contractor	Contract amount	Present complete
S 405	LSIA	Capolleti	$3,326,780,10	100
S 415	LSIB	Fitzpatrick	1,870,434.31	100
S 205/305	LS2&3	do	10,363,000.00	100
N 105	LS4	do	9,206,078.72	93
N 205/215/315	LS5A/5B/6B	Fitzpatrick Healy/TPI	21,888,459.15	80
N 305	LS6A	Wimpey	9,630,393.84	94
H 405	LS7	DeFelice	23,939,870.18	84

Percent Complee on February 15, 1983.

[Part B—Percent by Contractor]

Contractor	Total contract value	Percent of line contracts
Capolleti	$3,326,780.10	4.2
DeFelice	23,939,870.18	29.8
Fitzpatrick	21,439,513.03	26.7
Fitzpatrick/Healy/TPI	21,888,459.15	27.3
Wimpey	9,630,393.84	12.0
Total	80,225,016.30	100.0

TABLE 2.2.—*Numbers of primary structural components*

Component:	*Quantity*
Girders:	
Double T	2,333
Box	371
Steel	96
Girder subtotal	2,800
Piers:	
Type 1	1,078
Type 2	512
Type 3	238
Type 4	21
Type unique I to IV	315
Other types	174
Pier subtotal	2,338
Footings:	
Spread	609
Spread/anchor	450
Auger pile	363
Driven pile	512
Drilled shafts	6
Footing subtotal	1,940
Major component total	7,078

Compiled from data supplied by DCTA.

TABLE 2.3.—*Chronology of significant metrorail events*

1972—Voters of Dade County approved a $132.5 million bond issue to fund the local share of a rail rapid transit system (and to expand bus service), based on planning studies begun in 1964.

1973—The Office of Transportation was established and John A. Dyer appointed as Transportation Coordinator to carry out projects approved in the 1972 bond issue vote.

1976—UMTA awareded $15.2 million grant to support engineering of rail rapid transit system.

1977—UMTA committed $575 million to support construction of Stage 1, 16.5 miles from Dadeland to NW 67th Street, and authorizes final engineering of the additional four-mile segment to Hialeah.

In November, commitment was increased to $632 million on full-funding basis to reflect broadened scope.

1978—UMTA circulated and issued Environmental Impact Statement.

1979—First Phase 1 contract was awarded for University Station; groundbreaking of Phase 1 occurs there.

1980—Quality assurance and quality control programs related to construction were shifted to the Construction Management unit from Systems Engineering unit in April.

UMTA signed second full-funding contract and issued a letter of intent for $670.4 million in May.

First girder was poured at RTJV yard in Miami Lakes in August.

First Double T girder (Y–131) was erected, at University Station, in December.

1981—John Dyer left in June to assume chief executive position at Southern California Rapid Transit District. Deputy Transporation Coordinator, Warren J. Higgins, was named interim Transportation Coordinator.

From June to December, the responsibility for construction management of Metrorail was transferred from KTG to the Dade County Office of Transportation Administration [OTA] and its successor, the Dade County Transportation Administration [DCTA] on a phased basis.

In July, the County Commission approved creation of the DCTA to oversee all public ground transportation in Dade County, including Metrorail and Metrobus.

In October, Warren J. Higgins was named permanent Transportation Coordinator by the County Commission.

1982—In May, the last girder for the Southline was installed, completing nine miles of guideway from Dadeland South Station to the Miami River.

The County Commission approved acceleration of construction of Government Center Station to allow initiation of revenue service between Dadeland South and Government Center Station by December, 1983.

First Metrorail vehicle was shipped by Budd Company to U.S. Department of Transportation Test Center in Pueblo, Colorado, for initial operating tests.

In November the first rail was installed, near Dadeland South Station.

1983—OIG Report assessing construction procedures was issued in February.

Task Force was formed in March by the Urban Mass Transportation Administrator to review Metrorail construction.

Approach

The Task Force was comprised of engineers from TSC, UMTA and FHWA and organized into two teams corresponding to the two principal objectives: Quality of Work-in-Place and Construction Management. Staff from the OIG provided documentation collected during the course of its investigation. Outside expertise in the areas of on-site construction management, quality assurance, testing of reinforced concrete structures and structural analysis was obtained from Severdrup and Parcel & Associates, Inc., Main Construction Management, Inc., the Construction Technologies Laboratories [CTL] of the Portland Cement Association [PCA], and Northeastern University.

The study was divided into two phases. During Phase 1 (March 27 to April 8, 1983) the Quality of Work-in-Place team completed its initial visual inspection and conducted selected nondestructive tests necessary to develop its plan for the more extensive testing and analyses conducted during Phase 2 (April 9 to 28, 1983). The Construction Management team completed in Phase 1 its initial study of the quality control and quality assurance procedures which have been and are being employed by DCTA and its contractors.

In Phase 2 the Quality of Work-in-Place team conducted and completed its test program and performed required laboratory and structural assessments. During the same period the Construction Management team conducted in-depth reviews of records, documents and diaries pertaining to specific contract sections. Files were established to support the observations and conclusions concerning construction management practices.

Section 4 presents the findings resulting from the assessment conducted by the Quality of Work-in-Place team, and Section 5 presents an assessment of the Metrorail Construction Management Program. Section 6 summarizes the major conclusions and recommendations. A Glossary of Terms and Abbreviations is included at the conclusion of this volume.

Volume 2 contains the Appendices, consisting primarily of supporting data and exhibits. Volume 3 contains the consultants' reports.

METRO-DADE RESPONSE

TECHNICAL RESPONSE TO OBSERVATIONS AND CONCERNS CONTAINED IN THE TRANSPORTATION SYSTEMS CENTER [TSC] "TECHNICAL ASSESSMENT OF THE METRORAIL CONSTRUCTION PROJECT"

EXECUTIVE SUMMARY

Introduction

At the direction of Metropolitan Dade County Manager M. R. Stierheim, this technical response to Transportation Systems Center's [TSC] report of June 10, 1983 was prepared for the United States Department of Transportation's Urban Mass Transportation Administration [UMTA]. The response, entitled, "An Evaluation of Transportation Systems Center [TSC] Report on Metrorail Construction", was prepared by a Dade County Team, coordinated by the County Manager's Executive Assistant Bill Talbert and staff from the Metro Dade Transportation Administration [MDTA], the Kaiser Transit Group [KTG], as well as Dade County's Acting Inspector for Construction and Engineering, Jack Crognale and his staff. This team spent approximately 6,000 person hours evaluating the TSC findings. Technical assistance was provided to MDTA by outside consultants; Raths, Raths and Johnson [RRJ] of Willowbrook, Illinois, Brander Construction Technology, Inc. of Green Bay Wisconsin, and Erlin, Hime and Associates of Northbrook, Illinois.

Purpose

The purpose of Metropolitan Dade County's evaluation was to technically analyze and address the concerns raised by TSC's report to UMTA. Dade County's response is divided into five areas. First, the County evaluated each TSC observation to determine the accuracy of the observation and its significance, if any, to system safety, serviceability and durability. In the second area, the evaluation determined what repairs were actually needed, the correct repair methods to be used and their subsequent costs. The third area addresses some of the concerns raised by TSC's report, through the creation of a Quality Assurance Oversight Program. This Program, which reports directly to the County Manager serves two functions. It reviews all construction records, to determine if any additional follow-up is needed for the rest of the system, and it creates additional inspections during construction for critical items. MDTA And KTG continue to monitor and review the construction that has already been completed, especially in the South Line where MDTA is currently testing trains. The fourth area defines an In-Service Surveillance Program, providing long term, monitoring and review, as originally planned by MDTA. The final section summarizes the recommendations.

On June 24, 1983, Dade County issued an initial response to TSC's report. During the ten day initial review period of the TSC report, it was found that none of MDTA/KTG's top construction management personnel were interviewed by the TSC Team. In addition, the TSC team did not completely research the construction files. Nor did the TSC team prioritize the significance of its report findings, thereby leaving many questions as to the impact of the observations noted in their report. Finally, the results of non-destructive tests (Pulse Echo) were incorrectly interpreted, and consequently used to form erroneous observations, conclusions and recommendations. In light of the aforementioned observations of imprecise TSC research methodology, MDTA's preliminary conclusions of June 24 have been confirmed by the detailed evaluations of this report.

Findings

This technical response represents the most detailed special evaluation, of a new start rail rapid transit system, ever undertaken by an UMTA grantee. Every single observation/concern, which numbered 247, found in TSC's report was fully evaluated. The following conclusions are based on this extensive evaluation:

1. MDTA's detailed evaluation of TSC Observation/Concerns found nothing that questioned system safety.

2. As a result of MDTA's detailed evaluation, there are no significant changes from MDTA's initial June 24, 1983 response.

3. There is no change to the projected December 18, 1983 opening date as a result of MDTA's detailed evaluation of the TSC concerns.

4. Two hundred-fifteen (87.1%) of 247 TSC Concerns/Observations are either: proven false, the structure in question does not exist, were so inconsequential as to require no remedial action, final punch list type items or were concerns known to MDTA prior to the TSC review.

Only eight (3.2%) of the 247 TSC observations/concerns have been verified as originally found by TSC and requiring more than minor remedial action. An additional twenty-four (9.7%) concerns, are simply related to record keeping issues, for which final determination is only possible after field acceptance demonstrations by the contractor.

This technical evaluation, once again, supports Dade County's position that the Metrorail system is safe, well built and a system that the people of Dade County will use with great pride.

Recommendations

MDTA's recommendations remain the same as those submitted in its initial response of June 24, 1983. In summary the recommendation responses are:

1. MDTA has implemented a strengthened Quality Assurance and Quality Control Program that is the first of its kind. It can be used as a model by other jurisdictions participating in UMTA programs.

2. MDTA's analysis indicates that a vast majority of the TSC Concerns/Observations are so insignificant that little, if any, corrective action is required. In those limited instances where corrective action is required, such action has already been initiated, in accordance with applicable industry standards and at the contractor's expense.

3. The Quality Assurance Oversight Program has already begun the process of reviewing all as-built Metrorail construction, that which is under construction, as well as that which is designed but not yet constructed. If repairs are needed, they will be made using applicable industry standards and at the contractor's expense.

4. UMTA should require and oversee the implementation of a Quality Assurance Oversight Program for all major capital assistance grants. MDTA offers to assist in the development of an appropriate, practical Quality Assurance program which could serve as a model guide for the country.

5. As stated in our June 24, 1983 Initial-Response and according to MDTA's independent special concrete consultant, the interpretations of Pulse Echo Non-Destructive Test [NDT], utilized so heavily by TSC, proved not reliable as a technique for drawing conclusions about the quality of South Florida's concrete.

6. As to the "Dhondy issues" raised concerning girder safety, MDTA's special, independent structural consultant has unequivocally stated that those allegations are unfounded.[1]

7. Based on MDTA's independent structural consultant testing, it is concluded that the "Cassidy allegations" concerning girder strength and fabrication are without foundation.[2]

8. Of the 247 TSC observations/concerns, only eight which require more than minor remedial action, were originally found by TSC. It will cost $12,574 to repair these items.

9. Of the total 247 TSC observations/concerns, it will cost $62,942 to repair those items requiring any level of remedial action, regardless of who found the deficiency or whether it was an item already being repaired by MDTA.

10. It is estimated that the cost to prepare this report, including the value of staff time, is approximately $500,000. The opportunity cost to Metro-Dade for those employees involved in the response has been significant (opportunity costs are the cost of alternative decisions, i.e., what else staff could have been doing had they not been working on this response).

BACKGROUND AND INTRODUCTION

At the direction of Metropolitan Dade County Manager M.R. Stierheim, this technical response to Transportation Systems Center's [TSC] report of June 10, 1983 was prepared for the United States Department of Transportation's Urban Mass Transportation Administration [UMTA]. The response, entitled, "An Evaluation of Trans-

[1] Refers to Sarosh Dhondy, former KTG engineer.
[2] Refers to Peter Cassidy, former R.T. Joint Venture employee.

portation Systems Center [TSC] Report on Metrorail Construction", was prepared by a Dade County Team, coordinated by the County Manager's Executive Assistant Bill Talbert and staff from the Metro Dade Transportation Administration [MDTA], the Kaiser Transit Group [KTG], as well as Dade County's Acting Inspector for Construction and Engineering, Jack Crognale and his staff. This team spent approximately 6,000 person hours evaluating the TSC findings. Technical assistance was provided to MDTA by outside consultants; Raths, Raths and Johnson [RRJ] of Willowbrook, Illinois, Brander Construction Technology, Inc. of Green Bay Wisconsin, and Erlin, Hime and Associates of Northbrook, Illinois.

This response is organized into seven sections. The first Section, 1.0 is the Executive Summary which summaries the MDTA response. Section 2.0 is the Background and Introduction which describes the purpose of the response and provides background information and the chronology of events leading to this response. In addition, the Introduction includes the Methodology used to produce this response. Section 3.0 is the Analyses of TSC's report. The required construction repair costs are found in Section 4.0. The following Section 5.0, describes the comprehensive Quality Assurance Oversight Program. Long Term Continuing Review-Preventive Maintenance is discussed in Section 6.0. MDTA's Recommendations are contained in Section 7.0. Finally, all attachments, including the volumes of Technical Evaluation are found in the Appendix.

Purpose of Metropolitan Dade County's response

The purpose of Metropolitan Dade County's evaluation was to technically analyze and address the observations and concerns raised by TSC's report to UMTA. Dade County's response is divided into five areas. First, the County evaluated each TSC observation to determine the accuracy of the observation and its significance, if any, to system safety, serviceability and durability. In the second area, the evaluation determined what repairs were actually needed, the correct repair methods to be used and their subsequent cost. The third area addresses some of the concerns raised by TSC's report, through the creation of a Quality Assurance Oversight Program. This program, which responds directly to the County Manager serves two functions. It reviews all construction records, to determine if any additional follow-up is needed for the rest of the system, and it creates additional inspections during construction for critical items. MDTA and KTG continue to monitor and review the construction that has aready been completed, especially on the South Line where MDTA is currently testing trains. The final area defines an In-Service Surveillance Program, providing long term, monitoring and review, as originally planned by MDTA.

Background

On June 10, 1983, the Transportation Systems Center [TSC] issued a report to the Urban Mass Transportation Administration which dealt with the quality of construction on Metropolitan Dade County's Metrorail system. This report was preceded by meetings and events which involved Metropolitan Dade County, UMTA, the Federal Highway Administration, the United States Department of Transportation's Office of Inspector General and other concerned parties (see Attached Chronological Table of Events). It is important to emphasize that, to date, Dade County has not been advised as to why this construction review was originally initiated.

On June 24, 1983, Dade County issued an initial response to TSC's report. During the ten day initial TSC report review period, it was found that none of MDTA/KTG's top construction management personnel were interviewed by the TSC Team. In addition, the TSC team did not completely research the construction files. They did not prioritize the significance of their report findings, thereby leaving many questions as to the impact of the observations noted in their report. Finally, the results of non-destructive tests (Pulse Echo) were incorrectly interpreted and consequently used to form erroneous observations, conclusions and recommendations. In light of the aforementioned observations of imprecise TSC research methodology, the findings of the June 24 initial response, have been confirmed by the detailed structural evaluations of this ensuing response.

This technical response represents the most detailed special evaluation of a new start rail rapid transit system ever undertaken by an UMTA grantee. Every single observation, (247), found in the TSC's report was evaluated utilizing the following methodology:

Methodology

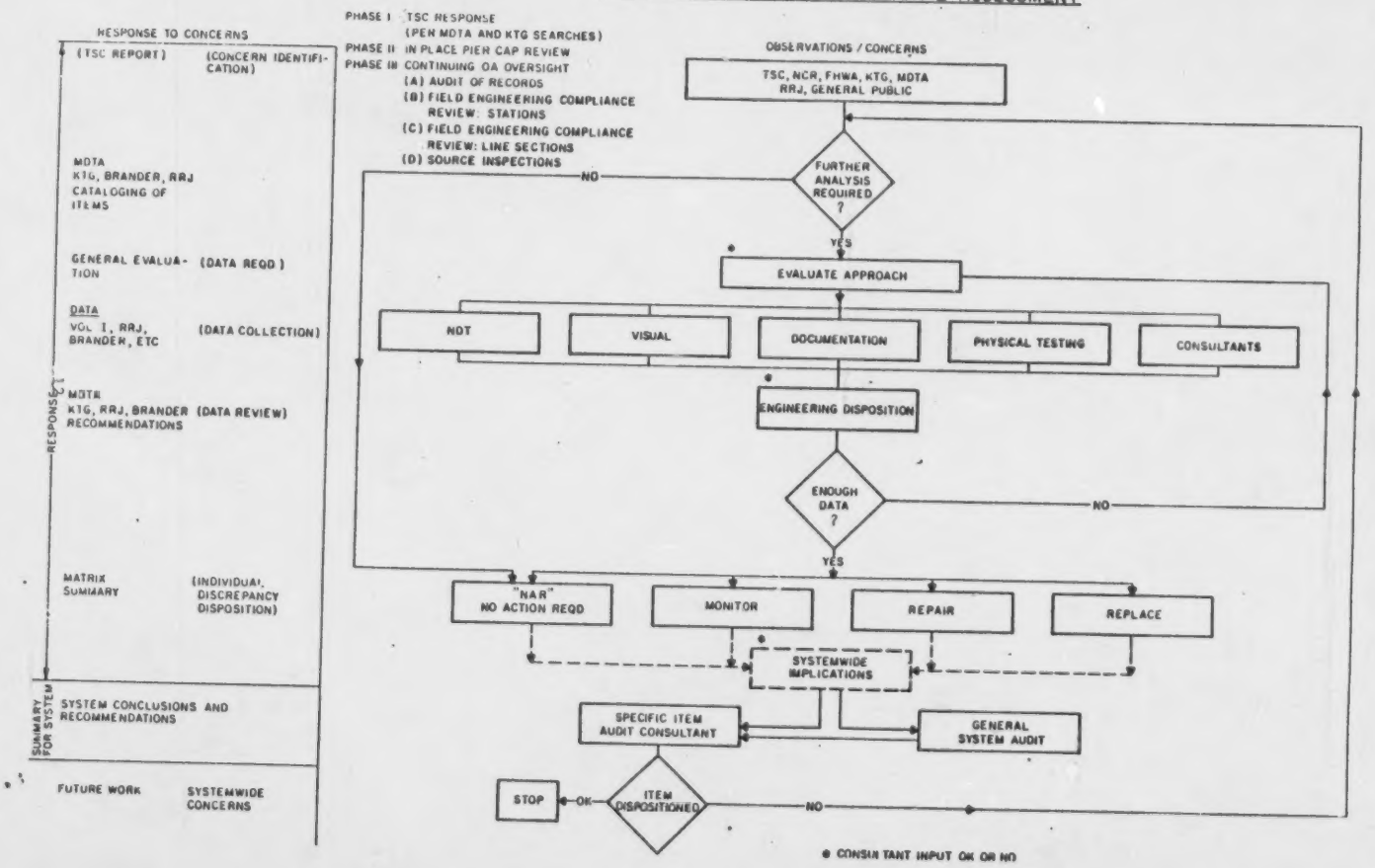
The Methodology used to address the concerns in the TSC Report is the same Methodology that MDTA has established for itself, through its Quality Assurance Oversight Program. This program provides for the continuous dispositioning of con-

cerns that might arise because of non-conformance to contract documents. This includes:

1. review of field inspection and testing, and records of same
2. design evaluations; a comparative analysis of the original design versus "as-built" condition
3. review of MDTA construction requirements
4. performance and confirmation of non-destructive testing
5. evaluation of non-destructive test results
6. petrographic or other material examinations
7. visual examination of concrete samples and completed structures
8. strength tests of concrete samples and completed structures or elements

(See the attached flow chart to understand how the information was processed through the system).

FLOW CHART - QA/QC STRUCTURAL ASSESSMENT



All TSC concerns and observations were identified and analyzed by MDTA/KTG, Brander or Raths, Raths and Johnson to determine if a potential problem existed. If there appeared to be a problem, the concern was evaluated as to the method of collecting data; i.e., NDT, visual, documentation, physical testing or consultant analysis. The pertinent data was collected, confirmed and transmitted to the MDTA/KTC Engineering Department for their evaluation and further dispositioning into one of four actions: No Action Required, Monitor, Repair, or Replace. An audit of the repair is included to assure that the work is performed completely and acceptably. At this point, a decision was made as to whether the concern should be included in MDTA's future monitoring program (Maintenance of Ways) or be part of a specific item audit.

In addition, in order to insure the accuracy and completeness of MDTA's response to the TXC Report, MDTA contracted with prominent consultants in the areas of structural analysis and "in place" concrete. These consultants performed the necessary tests and reviewed and evaluated MDTA's findings. (See RRJ letter "Metrorail TSCL/Response Review" dated August 30, 1983, on pages 22 and 23.)

The following consultants participated in preparing this response.

1. Raths, Raths, and Johnson of Willowbrook Illinois:

O.C. Gudelhoefer, Partner and Manager of Structural Investigations, is a Registered Structural Engineer in several states including Florida. His education includes; a BSCE from Purdue University, where he specialized in structural analysis and computer methods. Work on the Masters Degree level provided further study in Structural engineering especially in reinforced and pre-stressed concrete, with an emphasis on laboratory and model testing of reduced scale structures. O.C. Gudelhoefer has considerable experience in evaluating a wide variety of structures, including nuclear power plants and similar structures, such as reinforced concrete cooling towers, and reinforced and post-tensioned containment structures. His experience in the area of transportation includes: the evaluation, full scale testing, repair design, and original design of highway bridges of all common materials. His most recent endeavor includes the investigation and repair of the Cline Avenue post-tensioned concrete bridge which collapsed on April 15, 1982 in East Chicago, Illinois.

O.C. Guedelhoefer is a member of ACI, ASCE, ASTM, ANSI and other professional societies. He has served on several technical committees in each society and currently is serving on the Strength Evaluation of Reinforced Concrete Committee of the ACI, and on the Research Council on Performance of Structures Committee of the ASCE.

2. Brander Construction Technology, Inc. of Green Bay, Wisconsin:

Brander Construction Technology, Inc., was engaged by Raths, Raths, and Johnson, Inc., on behalf of MDTA because of their extensive experience evaluating "in place" concrete. Merle Brander has assisted in the resolution of concrete concerns on the Baltimore Rapid Transit System, Interstate highway bridges, nuclear containment vessels, cooling towers, dams, and many other structures. All of these investigations required non-destructive testing data. Merle Brander has a BSCE from Michigan Technological University and is a member of ACI, ASCE, IPA, PCI and other professional engineering societies.

3. Erlin, Hime Associates, Inc., Northbrook, Illinois:

Bernard Erlin the President and Chief Petrographer of Erlin, Hime Associates, which specializes in the analytical study of concrete to resolve the causes of concrete problems. Bernard Erlin has a B.S. from the University of Wisconsin. He has been active in petrography for 27 years and is a nationally recognized expert who has published extensively. His studies have involved field reconnaissance and laboratory techniques such as microscopy, wet chemistry, X-ray diffractions and flurescent spectropcopy and othe methods required to reduce concrete related problems. He is also an active member of The American Concrete Institute and The American Society for Testing and Materials. Mr. Erlin has consulted on a variety of projects which include: the Baltimore Rapid Transit System, Washington Metro System, Sunshine Skyway Bridge, Epcot Center, Tampa Airport, Library of Congress, among many others.

CHRONOLOGICAL TABLE OF EVENTS

On December 13, 1982, at the request of W.J. Higgins, Executive Director of MDTA, the firm of RRJ was asked to develop a program to evaluate girders. This program was to address certain alleged deficiencies and their possible impact on the strength and serviceability of the girders. As the evaluation proceeded, additional concerns were brought, forward and the scope of the work was broadened.

February 9, 1983, the United States Department of Transportation Federal Highway Administration [FHWA] issued a report for the United States Department of Transporation concerning allegations that "a significant amount of work is not being performed in compliance with the requirements of the contract documents."

March 23, 1983, the County Manager, Commissioner Clara Oesterle, Herb Priluck, the County's Inspector General for Construction and Engineering Services, Bill Talbert, Executive Assistant to the County Manager and Warren Higgins, Executive Director of Transportation for Metro-Dade County, met with UMTA Administrator Arthur Teele to discuss the FHWA report. During this meeting UMTA and Dade County agreed to the formation of a Task Force which would provide a technical assessment of the FHWA report.

March 28, 1983 UMTA Administrator Arthur Teele established a Task Force utilizing engineers from TSC, UMTA and FHWA. In addition, outside expertise was utilized in the areas of "on site" construction management, quality assurance, and testing of reinforced concrete structures. Mr. Herb Priluck, Dade County's Inspector General for Construction and Engineering Services was assigned to the team by the County Manager as the County's liaison.

June 1, 1983, Herb Priluck and his Assistant, Jack Crognale, at the request of TSC, reviewed the first draft of the assessment. The purpose of this review was to obtain Dade County's input into the Draft Report and to discuss the findings in the assessment.

June 8, 1983, the County Manager, Bill Talbert, Warren Higgins, Herb Priluck, and Jack Crognale met with Administrator Teele to discuss the draft report. At this meeting the County was informed by Administrator Teele, that the report would not be released prior to review by FHWA and the Department of Justice. The Dade County representatives at this meeting were assured that the County would have the opportunity to draft its response prior to the release of the report.

June 10, 1983, TSC issued its Technical Assessment to the Urban Mass Transportation Administration.

June 23, 1983, UMTA transmitted the TSC report to Dade County. Dade County was given 60 days to prepare a detailed response.

June 24, 1983, the County Manager submitted to the Board of County Commissioners and to UMTA, Dade County's Initial Response to TSC's report.

August 5, 1983, UMTA granted Dade County a one week extension for the submission of its response, due to a delay in receipt of test results from testing laboratories.

August 31, 1983, Metro-Dade submission of Technical Response to UMTA.

PERSONS WHO ASSISTED IN PREPARATION OF REPORT

1. Warren J. Higgins, Executive Director, Metropolitan Dade Transportation Administration [MDTA].
2. Charles C. Schimpeler, P.E., BSCE, MSCE, PhD, Project Director, Kaiser Transit Group [KTG].
3. William D. Talbert, MPA, Executive Assistant to The County Manager Metropolitan Dade County.
4. Jack Crognale, BSCE, Inspector General (Acting), County Manager's Office.
5. William H. McDaniel, PE, BSCE, MCE, Director, Engineering and Construction, Metropolitan Dade Transportation Administration.
6. Alan C. Wulkan, MA, Director, Government Relations, Metropolitan Dade Transportation Administration.
7. Otto C. Guedelhoefer, S.E., Partner, Raths, Raths and Johnson.
8. Merle E. Brander, PE, BSCE, Principal, Brander Construction Technology, Inc.
9. Bernard Erlin, Petrographer, President, Erlin, Hime Associates, Inc.
10. Edward C. Jensen, PE, BSCE, Deputy Project Director—Construction Support, Kaiser Transit Group.
11. Jose B. Gonzalez, Jr., PE, BSCE, MCS, Manager of Engineering Services, Construction Support, Kaiser Transit Group.
12. Harold Horowitz, PE, BSCE, MCE, Manager, Structural Engineering, Kaiser Transit Group.
13. Rene DeHuelbes, BSCE, MSTT, Civil Engineer, Kaiser Transit Group.
14. David R. Powell, Manager, Facilities Quality Assurance/Quality Control, Metropolitan Dade Transportation Administration.
15. Heather Brown, BSCM, Quality Control Coordinator, Facilities, Kaiser Transit Group.
16. Glenn F. Myers, PE, BSAE, MSCE, Sr. Design Engineer, Kaiser Transit Group.

17. Gianni Lehmann, BSCE, Field Audit Engineer, Metropolitan Dade Transportation Administration.
18. George J. Sokola, BSCE, Field Engineer, Technical Compliance, Metropolitan Dade Transportation Administration.
19. Lourdes C. Garcia, MPA, Administrative Assistant, Office of the County Manager, Metropolitan Dade County.
20. Eleanora Porobic, BSCE, Field Engineer, Metropolitan Dade Transportation Administration.

RATHS, RATHS & JOHNSON, INC.,
Willowbrook, Ill., August 30, 1983.

Re Metrorail TSC/Response Review, RRJ 82485.

Mr. WARREN J. HIGGINS,
Metro-Dade Transportation Administration,
Miami, Fla.

GENTLEMEN: Pursuant to your request, Raths, Raths and Johnson, Inc. (RRJ) was asked to conceptually review the KTG structural evaluations of the following generally described concerns expressed in the TSC report and addressed in the MDTA Response. Items reviewed included:

1. The impact that diagonal bars and horizontal plate assemblies placement may have on service load behavior of the ledges of certain pier caps referred to in the TSC report if the deviation from contract position is of the order of 5 inches total cover.
2. The impact that mislocated confinement bars and spline bars may have on the behavior of the pier cap ledge concrete in the vacinity of the shear key packets.
3. The concern for possible horizontal cold joints in the side walls of the box girders.
4. The concerns for possible impact on structural integrity related to possible missing or poorly defined shear keys in the column stem/foundation interface.
5. The possible impact on structural integrity of missing piles in pile cap noted in the TSC report.

Upon review of the items described above and based on discussions with KTG Structural Engineers, RRJ concurs with the general concepts employed and the general conclusions derived, including recommendations for further review of the pier cap conditions.

Yours truly,

OTTO C. GUEDELHOEFER III, *Project Manager.*

ANALYSIS OF TSC REPORT

MDTA's conclusions remain essentially the same as those reflected in its initial response of June 24, 1983. Two hundred fifteen (87.1%) of the TSC observations/concerns were either already separated by MDTA, were in the process of being repaired by MDTA, were so insignificant as to not require remedial action, were final "punch list" items that would be routinely cleared in project close out, were items for which a design evaluation had already taken place (the evaluation indicating that no remedial action was required), or were not problems at all. In fact, had the TSC team more thoroughly researched MDTA files or had these TSC analysts spoken with the appropriate MDTA/KTG construction management or construction support staffs, most if not all of the TSC report may never have been written. Eight TSC observationists/concerns (3.2%) have been verified as originally found by TSC and requiring more than minor remedial action. Twenty-four (9.7%) relate to issues for which a final determination is only possible when the Contractor proves performance with contract documents. Many of the items identified as "deficiencies" in the TSC report have subsequently been cleared by Dade County's special structural consultants (Brander Construction Technology, Inc.; Raths, Raths and Johnson, Inc., and Erlin, Hime Associates, Inc.). For the most part, deficiencies are actually misinterpretations of data generated by TSC's NDT (Pulse Echo) technique. The Brander report (Attachment G) explains NDT issues in great detail.

Technical evaluation of TSC observations/concerns

(a) Narrative Summary of Findings:

MDTA and KTG (MDTA's General Architectural and Engineering Consultant) along with special structural consultants [RRJ] conducted an in-depth evaluation of the TSC report. The evaluation included:

(1) Field inspection and testing by MDTA/KTG;

(2) KTG design evaluation (including a comparative analysis of original designs versus "as-built" conditions);
(3) MDTA/KTG review of construction documentation;
(4) Design evaluations and field inspection testing by special structural consultant (Raths, Raths and Johnson, Inc.);
(5) Evaluation by Brander Construction Technology, Inc., of the TSC NDT work;
(6) Non-destructive testing by Brander Construction Technology;
(7) Petrographic (microscopic) examination by Bernard Erlin; and,
(8) Strength test of concrete samples by Ardaman and Wingerter Laboratories.

The complete MDTA response to TSC observations/concerns is included in Technical Evaluation Volumes I through IV (Appendices A through L, attached). The MDTA response classification summary table (presented in (b) below) groups the results of the in-depth MDTA evaluation for the purpose of providing a concise assessment of Metrorail construction conditions.

The following comments describe the results presented in the summary table. One hundred and ninety-one (191) (77.3%) of two hundred and forty-seven (247) TSC observations/concerns should have been of no significance whatsoever in an objective technical assessment of a major public works project. (MDTA Response Classification 1-5) Seventy-seven (77) were derived from NDT's proven to be incorrectly interpreted; fifty-four (54) were derived from TSC observations or tests proven to be false; seven (7) were related to structures which do not exist; thirty-three (33) were derived from a review of MDTA records or from an FHWA report and were proven to be false; and, twenty (20) were so inconsequential as to require no remedial action. Another twenty (20) observations/concerns (MDTA Response Classification 6) relate to punch list type items which will be dealt with routinely in project close out. Four (4) items (MDTA Response Classification 7) are those for which MDTA had directed repair prior to TSC involvement. Therefore, 215 TSC observations/concerns (87.1%) were either false, were for structures which do not exist, were so inconsequential as to require no remedial action, were punch list type items or were dealth with by MDTA prior to TSC involvement.

SUMMARY TABULATION OF SPECIFIC TSC OBSERVATIONS/CONCERNS AND ASSOCIATED MDTA RESPONSES

Response classification and observations/concerns and associated MDTA responses	Frequency of occurrence	Percent
1. TSC/NDT related concerns proven false	77	
2. TSC observations suggesting concerns proven false	54	
3. TSC observations for which no structure exists (clarification required)	7	
4. Concerns suggested by TSC review of MDTA construction documentation or FHWA observations proven to be false	33	
5. Concerns suggested by TSC review of MDTA construction records or FHWA observations requiring no remedial action	20	
6. TSC observations constituting surface imperfections to be routinely dealt with as final punch list items	20	
7. TSC observation related to remedial action directed by MDTA prior to TSC involvement	4	87.1
8. Concerns resulting from TSC review of MDTA construction records or FHWA observations requiring acceptance testing due to missing construction record	24	9.7
9. TSC/NDT related concerns requiring remedial action	4	
10. TSC observations requiring remedial action	4	3.2
Total	247	100

There exist another twenty-four (24) items (9.7%) (MDTA Response Classification 8), which are of concern due to absence of appropriate construction documents sufficient to establish a liaison for acceptance of the structural element in question. In these cases, the burden of proof rests with the Contractor to establish a basis for final acceptance by MDTA and the contractors have to be notified to provide such proof.

Finally, four (4) NDT related concerns and another four (4) observations, or test related concerns, exist for which remedial action is indicated. Therefore, only eight (8) are items originally found by TSC that require more than minor remedial action (out of 247 observations/concerns). This number constitutes 3.2% of the TSC observations/concerns total allegations. In summary, out of 247 TSC observations/concerns requiring more than minor remedial action only eight (3.2%) have been veri-

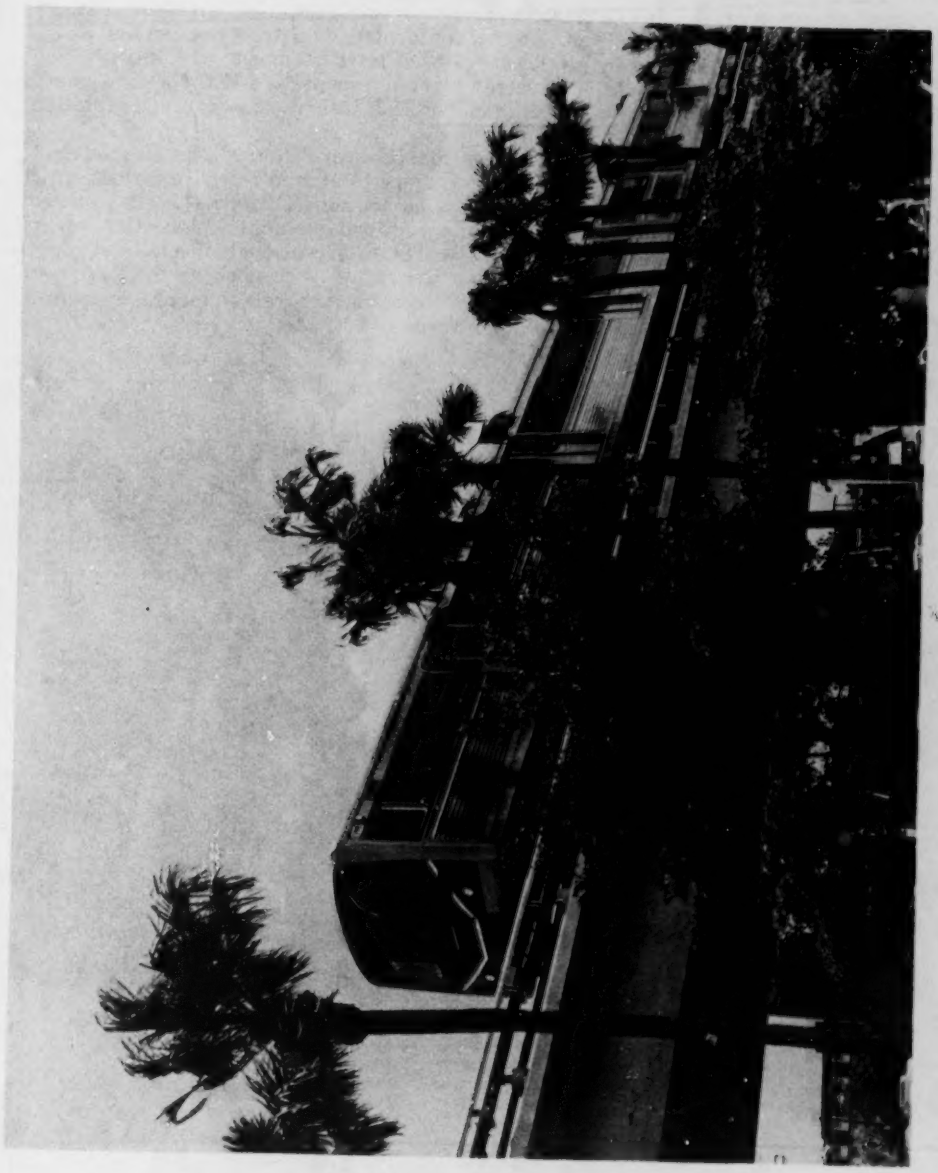
fied as construction discrepancies not previously identified by MDTA, while an additional twenty-four (24) (9.7%) relate to issues for which a final determination is possible only with proof by the Contractor of conformance contract documents.

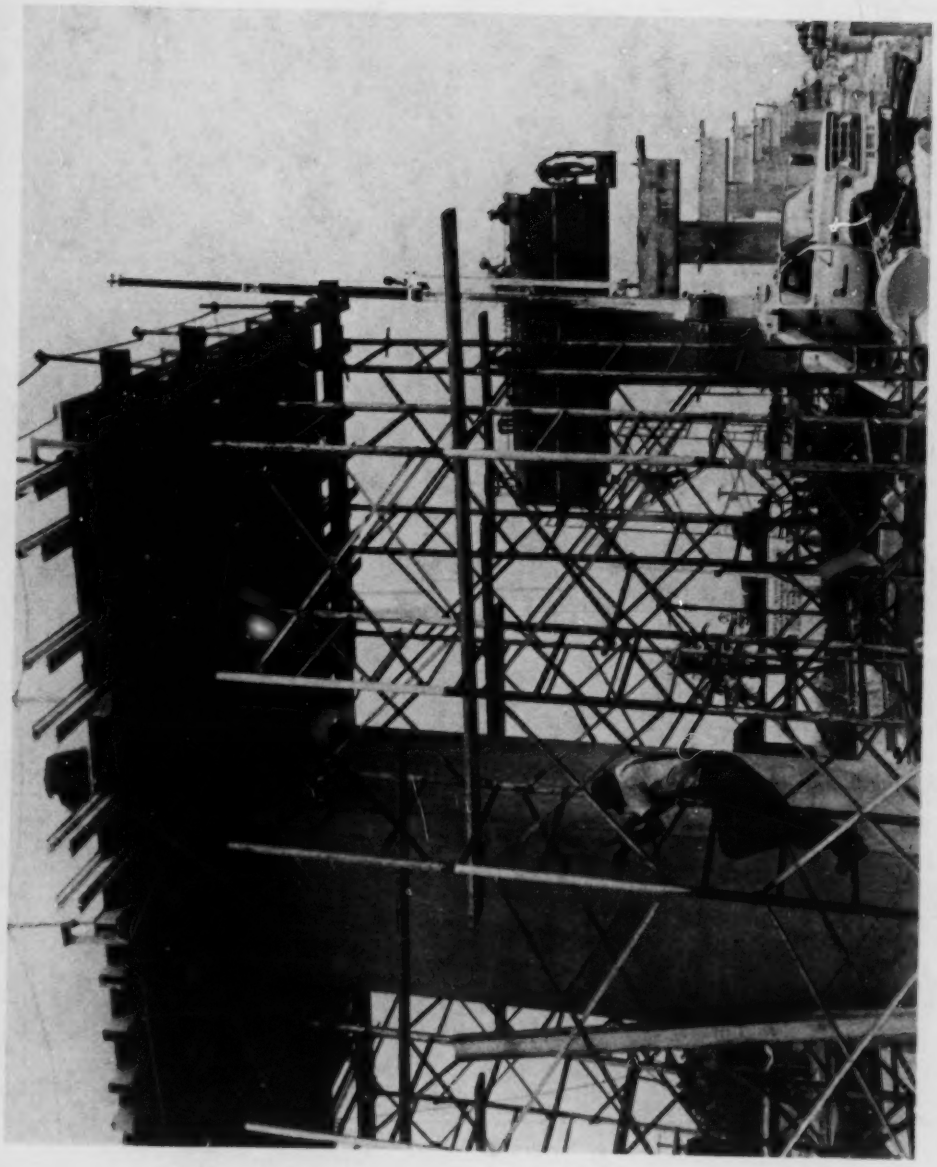
(*b*) Tabulation of Results by MDTA Response Classifications:

The preceding summary table presents MDTA responses to TSC observations/concerns. The summary identifies the number of TSC observations/concerns relating to each MDTA generic response classification.

(*b*) Complete Tabulation of TSC Observations/Concerns and MDTA Responses:

All 247 specific TSC observations/concerns are tabulated in the matrices entitled "Summary of MDTA Responses to TSC's Observations/Conserns" (Attachment 1). These detailed tabulations identify each structural element in question (by pier number or girder number), summarize the TSC observations/concern and identify the generic MDTA response classification associated with each of the 247 specific TSC observations/concerns. The order of these structural elements is from the southern end of the line and works northward.





[FROM JAN. 1984 MASS TRANSIT MAGAZINE]

MIAMI METRO GETTING READY FOR THE FUTURE

(By Rick Hirsch)

Bedeviled by construction flaws, design problems, a $120 million cost overrun and a critical shortage of railcars, Miami's Metrorail—the longest new elevated transit system in the United States—is about to bring the Magic City of surf and sun into transportation's 20th century.

The nagging and yet unanswered question is when.

The planned opening for the southern, 11-mile/17.7-km leg of the 21-mile/33.9-km, $987 million system was set for Dec. 18. But, a decision on Nov. 14 by the Dade County Commission, the political body overseeing Florida's largest-ever public works project, indefinitely delayed the opening. Contributing to that decision is the painfully slow delivery of railcars from the Budd Co. in Philadelphia and the realization that an incomplete engineering review of the design and construction of the complicated "hammerhead" pier caps designed to support major segments of the system's elevated guideway wouldn't be finished until late November.

When Metrorail does open—once a myriad of construction and design questions are resolved—the system's south line promises to carry approximately 100,000 commuters daily from the Greater Miami area's southern suburbs to its booming downtown, making several innovative strides in the procees. When it's finished, all the problems, from cost overruns to federal investigations, will be vague memories, said U.S. Rep. William Lehman of North Miami, who has shepherded funding for 80% of the project's cost through the House Appropriations Subcommittee on Transportation, which he chairs.

"I think that after Metrorail is in operation, myself, the people at UMTA (the Urban Mass Transportation Administration) and those in Miami who have wrestled with this system and the doubts some of the investigations have raised will find that all is forgotten," Lehman said. "We will wonder how Miami ever managed to survive without it."

By Christmas 1984, the entire 21-mile/33.9-km first phase of Metrorail should be running, carrying upwards of 200,000 commuters each day, says Warren Higgins, executive director of the Dade County Transportation Administration (DCTA) and former head of the Massachusetts Bay Area Transportation Authority (MBTA). Metrorail's northern leg will link the southern suburbs with Dade County's predominantly black and Latin neighborhoods in the northwest.

The system features coin operated turnstiles, made by Cubic Western Data, currently planned to twist for a $1 fare. The only farecards used will be for monthly passes for regular commuters, students, the handicapped and the elderly.

Metrorail also features the cheapest cost per mile for any transit system built in recent years, said Higgins, attributable to its elevated design. South Florida's high-water table made a subway impossible, which has become something of a blessing. The Miami system was built for about $50 million a mile, half the cost of the Baltimore subway that opened Nov. 21. Dade County officials and Rep. Lehman say that the low cost per mile may help Dade County acquire funding at a high federal-local ratio for the planned 22-mile/35.5-k second phase of Metrorail.

The first phase was paid for 70% by the federal government, 10% by the state of Florida and 20% by Dade County. While Lehman predicts the federal percentage is certain to decline for phase two, he said a two-thirds federal share—and perhaps a three-quarter share—might be possible due to the system's low cost per mile.

"We may be able to do very well on funding because ours is the cheapest system to build per mile, being above ground," Lehman said.

The system also will feature another major first, when in spring or summer 1985, it is linked with the under-construction downtown people mover. Metrorail then will become the first system with a people mover component (see related story).

The Metrorail system includes strikingly simple station design, accented in lush green by an extensive landscaping program designed to take advantage of South Florida's subtropical climate. The 21-mile/33.9-km guideway, when finished, will be a striking linear park, Higgins said, with bicycle paths running its length, weaving in and out of concrete columns and stately palms.

Add to that a joint development program that promises to provide the system with several parking garages and a small but steady revenue stream, and an ambitious and controversial multi-million dollar Art in Public Places program that has put in 1.5% of the cost of each station to pay for major works of sculpture and "you've got a pretty impressive achievement," Higgins said.

Higgins also boasts of a minority participation program that brought construction contracts and subcontracts to dozens of black and Hispanic owned firms, despite increasing the difficulty of construction management.

"We knew when we started it would be easier to have only a few prime contractors," Higgins said.

"But the (county) commission made a commitment that minority firms would share in the work," he said.

Despite the accomplishments and the system's bright future, the current status of Metrorail is tenuous at best. A two-year-long probe by the U.S. Department of Transportation (DOT) Inspector General's Office into allegations of shoddy construction continues. In March, that investigation led to a review of the system by DOT's Transportation Systems Center (TSC) of Cambridge, Mass., which concluded in July that Metrorail was riddled with construction errors and mismanagement. Although county officials branded that report "a hatchet job" and issued a 10-volume rebuttal, the TSC review led the county to create a quality control and assurance team that, in the last three months, has turned up an average of 500 construction flaws—ranging from the serious to the silly—in each south line station, including the five terminals that already had been dedicated.

The problems ranged from the discovery that the passenger platform at one south line station was built too wide, raising the possibility of a train sideswiping the station, to a systemwide roofing problem. Leaks have been found at almost every station, including power substations and transformer rooms.

Other parts of the south line are unfinished, including its largest station and the signaling and train control system.

The two most serious problems provide Metrorail's biggest question marks. Officials won't know until Nov. 18—after extensive load testing is done—if Metrorail's controversial hammerhead pier caps can withstand the loads they were supposed to be designed for. And delivery of the railcars is uncertain.

Under the county's orginal contract with its railcar builder, The Budd Co., Dade County should have received all 136 railcars it ordered by April 1982. That schedule was derailed almost two years ago by a strike by Westinghouse Air Brake Co. (WABCO) and management problems at Budd's plant in Red Lion, Pa. Budd then promised the county 60 railcars in time for the orginal Dec. 18 opening. Last winter, the county lowered its estimate of expected cars to 40 and said that was the minimum it could receive and provide the rail service it promised when it sold Dade County voters the rail system in 1978 and 1972—headways of three to four minutes. By summer, the car count was down to 20, and Higgins now says as few as 12 cars are available for testing.

Without more cars, operations planners project waits of 15 to 20 minutes between trains in the morning and evening rush hours when the line does open, and have raised the possibility that no midday service can be provided until substantially more cars arrive. It also means dropping the hoped for 100,000 daily south line ridership on opening day to less than 25,000 riders.

"I expect to enjoy the opening of this system," said Dade Commissioner Beverly Phillips, a member of the county committee overseeing Metrorail, after a heated public meeting in early November. "We've waited 11 years (for Metrorail), we can wait a little longer."

The initial planning for Metrorail actually began in 1964, when county officials studied the feasibility of transit in Dade. In 1969, as the county's population approached 800,000, the study was completed, and it was determined that transit was feasible. Two years later, officials began lobbying for the 51-mile/82.3-km system recommended by the study. One year later, Dade County voters approved by a 2-1 margin a $132.5 million bond issue to fund the local share of the transit system's cost. The final design planning began.

Preliminary engineering was finsihed in 1976, and UMTA initially committed itself to pay 80% of the system's cost. In 1977, in two separate actions, UMTA committed $575 million to pay 80% of a 16.5-mile/26.6-km rail system. They also authorized money to pay for engineering studies of a 4-mile/6.5-km addition. In late 1977, UMTA agreed to pay an additional $57 million for the added 4 miles through largely blue collar-and predominantly Latin—Hialeah, a 150,000 population suburb of Miami in the northwest corner of Dade County.

Then the rail project, for a time, stopped rolling. A group of citizens collected enough signatures on petitions to force a referendum that would have stopped all further local spending on the rapid transit system. In March 1978, the referendum failed by less than a percentage point.

Fifteen months later, ground was broken on Metrorail's south leg, aided by the county's purchase of a 9.5-mile-long/15.3-km railroad right of way owned by the Florida East Coast Railroad.

The 11-mile/17.7-km Metrorail leg Dade County officals want opened soon touches at least a trace of each part of this tri-ethnic community, linking the fashionable suburbs of its southwest side with Miami's large Latin and Black communities and its booming downtown.

The system starts in the south with two stations straddling Dadeland Mall, the county's busiest regional shopping and office area. The southernmost station, Dadeland South, is designed to serve affluent single-family areas to the south and east.

Less than one mile north of that station—and next to the mall—is Dadeland North Station. Planners say more Metrorail riders will begin their daily commute here than anyplace else. When the entire 21-mile/33.9-km Metrorail first phase is finished, 23,000 passengers a day are expected to pass through Dadeland North.

The two Dadeland stations are the sites for Dade County's two major transit joint development projects, one of which already is under construction. At Dadeland South, a Miami firm known as the Green Companies has started work on a 17-story office, restaurant and hotel complex. In exchange for the use of less than two acres of county owned land at the station, Green is building Metrorail a 1,000-car multilevel garage and has pledged a percentage of future revenue from the complex annually to help pay Metrorail's operating subsidies.

At Dadeland North Station, Green also entered into a joint development deal with Dade County. Here the firm has promised 2,000 spaces in a parking garage and plans to build an even larger project including another hotel, 27-story condominium towers, offices, restaurants and a trendy shopping complex called Riverwalk on either side of the narrow Snapper Creek Canal, which flows beneath the rail station and its bus bay area. In addition, if Dade County wants to pay for it, Green said he will build an auditorium within his complex for plays, concerts and public meetings.

Construction at Dadeland North is expected to begin within three years.

Metrorail also has spurred a major development at its next stop, South Miami Station. Located in a suburban municipality, the station is within three blocks of its city hall, a public housing project, and the city's small but sophisticated shopping district. Within two blocks is a seven-acre construction site known as Bakery Centre, where a vintage bakery is being replaced with a bulky shopping, hotel and office complex, for which the price tag has been placed at $100 million.

Heading northeast, Metrorail stops next in Coral Gables, Miami's historic planned suburb. Known as University Station, the Gables terminal is adjacent to the University of Miami, a 20,000-student private university. It is planned mainly as a destination station.

Continuing toward downtown, Metrorail will stop at Douglas Road, where a middle-class housing project is planned near an existing industrial area, and then on the western edge of Coconut Grove, the palm tree-lined hamlet where many of Miami's first residents settled. Next stop is Vizcaya Station, which bears the name of the historic Mediterranean mansion across from the station on Biscayne Bay. Vizcaya is one of Miami's most popular sightseeing stops, and on its grounds are the county history and science museums and its planetarium.

The system then stops just west of Brickell Avenue, the lushly landscaped boulevard flanked by glass and chrome skyscrapers that house Miami's emerging international trade and banking offices and expensive condominiums. Then the Metrorail guideway slowly climbs to 75 ft./22.7 m—its highest point—for a majestic pass over the Miami River into the city's downtown. The rise declines to the height of a three-story building as the guideway eases into Government Center Station, which ultimately will be the center of the transit system. (Problems with the roof canopy of this station is another reason the system opening was delayed).

Government Center is the nucleus of the full, 21-mile/33.9-km Metrorail first phase and is expected to be the mid-point of a 22-mile/35.5-km second leg now being studied. When phase one is completed, almost 50,000 commuters each day are expected to pass through Government Center, adjacent to Metro-Dade Center, the county's soon-to-be-completed, 30-story, $75 million administration building.

Planners envision about 40,000 of those passengers at Government Center to transfer to Miami's 1.9-mile/3.1 km people mover system, known as Metro-Mover. The Metro-Mover guideway is now under construction and is scheduled for completion in spring or summer 1985.

The last stop on the south line will be one mile/1.6 km north, at Overtown Station. When Higgins announced the early opening for the south line in the summer of 1981, Overtown wasn't included. But the county has paid contractors extra to

speed up work there, because Overtown lies on the southern edge of the largest portion of Miami's black community.

"This gives us our first major link with the core of Miami's black community," Higgins said.

The remainder of the system, currently scheduled to open in December 1984, extends northwest through the black communities of Brownsville and Liberty City, the scene of Miami's tumultuous May 1980 riots. Then the system heads west through predominantly Latin Hialeah, with a stop at the fabled Hialeah Race Track.

The route ends in Hialeah at the William Lehman Yard and Shops, named for the North Miami congressman who has played Metrorail's benefactor to the tune of almost $700 million in federal funds.

Aside from the people mover, the other key to making Metrorail work is Dade County's beleaguered Metrobus system. Currently, about 450 of the county's bus fleet ride Miami's streets daily. But the system is plagued by maintenance problems and a shortage of new, reliable buses.

County officials hope a new preventative maintenance program and an aggressive campaign to purchase new buses will improve service, which Higgins has described in past public meetings as "horrendous."

Meanwhile, as Metrorail's service levels increase on the south line, the county plans to phase in a "spoke" system of service revolving around the 11 south line rail stops.

And officials continue to plan for Metrorail's future expansion, which Higgins predicts will eventually reach the 51-mile/82.3-km system presented to Dade County voters more than a decade ago. Higgins points to the size and sophistication of the Lehman Yard and Shops as an example of how realistic that 51-mile goal is.

The yard has a capacity, Higgins said, for about 500 cars in a circular system. "We've got all the room we need to grow. We're ready for the future."

METRO-MOVER: THE UNIQUE LINK

(By Rick Hirsch)

The most innovative link in Miami's $1.1 billion mass transit investment is its smallest component—the 1.9-mile/3.1-km people mover—rubber-wheeled trams which will loop the city's central business district.

MetroMover, as Dade County officials have dubbed the downtown loop system, should siphon about 40,000 passengers daily from Metrorail's busiest destination station in the heart of downtown, and distribute them quietly and cheaply at eight stations around the city's core.

Cheaply, says Warren Higgins, Dade County's top transit official, because the people mover will be totally computerized, and won't require operators. "Just like an elevator going sideways," is how Higgins described the system.

Construction of the people mover, the only one in the nation in an urban setting to actually reach the construction stage, began 15 months ago. Construction of the 1.9-mile/3.1-km guideway began in early summer. The $132.1 million system, being built by prime contractor Westinghouse Transportation Division under a $99.2 million contract, should open in spring or summer 1985, becoming the first such system in the United States to connect with a heavy rail system.

In retrospect, some local officials are amazed the people mover is being built at all. "It has survived a lot of adversity," said Higgins. The adversity came in a blend of spiralling construction costs and plummeting interest in people movers by federal officials, who once ordered the project scrapped.

In 1978, when Dade County voters rejected a referendum to stop spending money on rapid transit, the people mover's cost was pegged at $24 million for a 1.6-mile/2.6-km loop. During the next five years, that figure rose faster than the proverbial speeding bullet.

Six months after voters kept transit alive, the cost estimate for the people mover more than tripled to $76 million. By mid-1980, its price tag was $92.5 million. It reached $116.9 million in the fall of 1981, and its current estimate, $132.1 million, this spring.

But the greatest problem of all came in 1981 when the Reagan Administration decided that the U.S. Department of Transportation would not be funding any people movers. "It was buried," remembered U.S. Rep. William Lehman of Miami, chairman of the transportation subcommittee of the House Appropriations Committee, and the man who, for the last five years, has been Metrorail's guardian angel on Capitol Hill.

Since the administration didn't want to fund people movers, Lehman tried what he now describes as "some sleight of hand." He changed the project's name from "people mover" to the "Downtown Component of Metrorail," making it officially part of the heavy rail system.

Transportation Secretary Drew Lewis and Urban Mass Transportation Administration (UTMA) Administrator Arthur Teele bought the semantical change.

"The phoenix rose from the ashes," Lehman said. "Sometimes euphemisms can do more to make something happen than logic or anything else."

The name change may have saved the people mover, but UMTA officials also extracted a promise from Dade officials when they approved funding for the "Downtown Component of Metrorail." The county agreed to seek no more money for its first-phase construction from the federal government, which will wind up paying 70% of the project's cost.

Instead, county officials set up a special taxing district to be paid by downtown businesses along the people mover route. Bonds will be sold—$30 million worth—against money raised by the district.

On the drawing board for the people mover are two extensions of about one mile each/1.6 km with an estimated price tag of another $200 million. Initial engineering and planning have begun

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METRO-DADE TRANSPORTATION ADMINISTRATION,
Miami, Fla., January 25, 1984.

Mr. CHUCK KROUSE,
House of Representatives, Committee on Public Works and Transportation, Washington, D.C.

DEAR MR. KROUSE: Attached please find a press release dated January 16, 1984 regarding a major milestone reached in the testing of "inplace" pier caps constructed to support the Metrorail Guideway. Tests of the in-board bearing areas demonstrate extraordinary capacities which therefore obviate the need for any significant level of repair. Concerns relating to fatigue resistance of all pier caps were favorably dispositioned. A very favorable result was found as regards the special "T" ledge.

We are of course very happy with these results and would appreciate you sharing them with the House Public Works Subcommittee on Investigations and Oversight. I will continue to keep you informed of all testing results and of Metrorail progress in general.

Please advise me if I can be of any further assistance to the Subcommittee.

Sincerely,

WARREN J. HIGGINS, *Executive Director.*

THE KAISER TRANSIT GROUP,
Miami, Fla., January 16, 1984.

Structural engineers supporting the design and construction of Metrorail have successfully reached a major milestone in the testing of "in place" pier caps constructed to support the Metrorail Guideway. Work completed on the evening of Friday, January 13, 1984 produced the following favorable indications relating to the design and construction of Metrorail's guideway supports known as "hammerhead pier caps."

1. The cap tested on Friday was BT cap (so designed because one side of the cap carries very heavy guideway box girders while the other side of the cap carries the lighter and more standard double T girders).

2. Tests of the in-board bearing areas (bearings previously reported as in some cases being characterized by misplaced reinforcing steel) demonstrates high capacities for these in-board bearings. These extraordinary capacities should obviate the need for any significant level of repair of this discrepant condition on the in-board ledges.

3. Concerns relating to fatigue resistance of all pier caps were favorably dispositioned as a result of the Friday tests.

4. The special "T" ledge (the side of the cap supporting a double T girder) was tested to failure at 440,000 pounds. This is a very favorable result inasmuch as the design strength of these ledges is required to be 440,000 pounds, pointing to significant reserve strength in the "T' ledge. The unique design of the "T" ledge tested (a ledge designed not to include diagonal bars) constituted a portion of the justification for undertaking this fourth major pier cap test.

The series of four pier cap tests has produced a suggested procedures for analyzing and discrepancy in pier caps throughout the Metrorail system, relying on codified (nationally accepted) structural analysis procedures coupled with actual performance of the Metrorail caps when tested to failure (tested far beyond anticipated future train loads). This powerful computerized model suggests an expeditious procedure for reviewing any potential discrepancy and will permit the definition of fully acceptable but simplified remedial steps where necessary.

Mr. LEVITAS. The subcommittee will come to order.

As we resume the hearing on construction of a new rail transit system in Miami and implications for the Federal program, we resume with witnesses representing the Urban Mass Transportation Administration of the U.S. Department of Transportation. With us this afternoon are the Administrator, Ralph Stanley, the Acting Deputy Administrator and Chief Counsel of UMTA, Mr. Kent Woodman, and Robert McManus, Associate Administrator for Grants Management in UMTA.

While we wait for Mr. Woodman to arrive, let me say this. We welcome you, and look forward to your testimony. This subcommittee, of course, has over the years had a very keen interest in the workings of urban mass transit. We have issued a number of reports based on our oversight investigations, and this, I believe, Mr. Stanley, is the first time you have testified before our committee.

Mr. STANLEY. Yes, sir.

Mr. LEVITAS. And that we should meet for the first time in Miami is somewhat unusual, given our oversight jurisdiction, but it is good to meet you anyway wherever it is.

Mr. STANLEY. Thank you.

Mr. LEVITAS. In fact, Miami is a nice place to do just about anything, and we will look forward to your testimony. Mr. Woodman, I am sure, will be here in just a few minutes, so why don't we go ahead and get started, and then when Mr. Woodman arrives, we can let him join you at the table.

Would you and Mr. McManus raise your right hands, please?

Do you solemnly swear that the testimony you give before the subcommittee today will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. STANLEY. I do.

Mr. MCMANUS. I do.

Mr. LEVITAS. Thank you very much.

Mr. Stanley, of course your entire statement will be made part of the record in its entirety, without objection, and you may proceed as you so desire.

TESTIMONY OF RALPH STANLEY, ADMINISTRATOR, URBAN MASS TRANSPORTATION ADMINISTRATION, ACCOMPANIED BY G. KENT WOODMAN, ACTING DEPUTY ADMINISTRATOR AND CHIEF COUNSEL, UMTA; ROBERT McMANUS, ASSOCIATE ADMINISTRATOR FOR GRANTS MANAGEMENT, UMTA; GENE E. CARROLL, DIRECTOR, OFFICE OF MANAGEMENT AND TECHNICAL ASSISTANCE, ATLANTA REGIONAL OFFICE, AND JAMES A. O'CONNOR, REGIONAL ADMINISTRATOR, ATLANTA REGIONAL OFFICE

Mr. STANLEY. Good morning, Mr. Chairman, and members of the committee. I am pleased to have the opportunity to address the committee today about construction managment of UMTA financed

projects. With me today are the UMTA Chief Counsel, Kent Woodman, and the Associate Administrator for Grants Management, Bob McManus. Also joining me today are Jim O'Connor, who is UMTA's Regional Administrator for this region, and Gene Carroll, who is an engineer in the regional office in Atlanta.

Your letter inviting me to testify raises the broad question of whether the capital assistance program as administered by the Urban Mass Transportation Administration guarantees satisfactory quality assurance and quality control on this federally funded construction. The letter cites the Miami experience as a case in point raising your concern, but states that your interest goes beyond this specific construction project to the overall UMTA program as well.

It also states your understanding that UMTA has been examining several options for improving quality assurance and quality control in the program it administers, and asks that I discuss these options and any recommendations in my testimony.

Mr. Chairman, as you know, I am relatively new to UMTA, having joined the staff as a Special Assistant to the Administrator on September 26 of this year. I was confirmed as Administrator on November 18, 1983. Therefore, while I am of course very familiar with these issues, my personal exerience with them dates only from September.

I would like to begin with a brief reference to the Miami Metrorail situation, inasmuch as it led to an overall internal assessment by UMTA of its construction management oversight practices. I will then briefly review UMTA's construction management oversight practices compared to those of other Federal agencies, some within the purview of this committee, and the options we have considered relating to this issue. I will also briefly describe construction management as conducted by a number of UMTA's grantees on new systems.

Mr. MOLINARI. Would you yield for one moment, please? I see Mr. Woodman.

Mr. LEVITAS. Mr. Woodman, welcome. Would you raise your right hand, please?

Do you solemnly swear that the testimony you give before the subcommittee will be the truth, the whole truth and nothing but the truth, so help you God?

Mr. WOODMAN. I do.

Mr. MOLINARI. Mr. Chairman, before the witness proceeds further, Mr. Stanley, would you mind giving your background prior to your becoming Administrator, particularly with reference to your prior service with UMTA?

Mr. STANLEY. I had joined the Department of Transportation in March 1981. I served as a Special Assistant for Policy with Secretary Lewis. When Secretary Dole came to the department, I became her Chief of Staff in the Secretary's office. I was actively involved in a number of UMTA issues from the Secretary's office, including the Surface Transportation Assistance Act of 1982, which was passed last winter.

Mr. LEVITAS. You may proceed.

Mr. STANLEY. Thank you.

In Miami, the Metro-Dade County Transportation Administration initially delegated all field inspection responsibilities to their

consultants, the Kaiser Transit Group, but maintained a near duplicate construction management staff for positions of area engineer to the chief of construction. Responsibility for quality control was that of KTG while the function of quality assurance was being performed jointly by KTG and MDTA. The only exception to this was that the girder manufacturer, R. T. Joint Venture, was contracted to perform quality control on the precast girders with KTG providing continuous quality assurance inspection.

As construction progressed, MDTA assumed greater responsibility for field inspection and eventually took over all construction management functions and responsibilities. Before the transition, an organization separate from the field inspection forces was responsible for quality assurance. After the transition, the authority/responsibility for quality assurance of completed structures was transferred to the construction division, and therefore was no longer independent of production.

UMTA oversight of the Miami Metrorail project is performed by UMTA Region IV personnel in Atlanta. They attend quarterly review meetings and are concerned primarily with cost and schedule performance of the grantee. Cursory inspection of construction progress is all that is possible with the current staff limitations.

With respect to Miami in particular, on March 15, 1983, the Department of Transportation Inspector General advised the UMTA Administrator that there were potenital construction problems on the Miami Metrorail project. UMTA decided to investigate, and retained the Department's Transportation Systems Center to assist it in reviewing the IG's concerns and conducting onsite investigations. The report of this study team was submitted to the Administrator in June, and apart from its general conclusions and recommendations with respect to Miami, recommended that UMTA increase its attention to quality assurance and quality control plans for major capital assistance grants and oversee their implementation. This recommendation generated an overall assessment of UMTA's construction management oversight practices which I shall discuss momentarily.

With reference again to Miami as a case in point, UMTA determined that further Federal oversight would be appropriate and beneficial. Accordingly, a respected engineering firm, Morrison-Knudsen, was retained to assist UMTA in reviewing and analyzing Miami's efforts to correct construction deficiencies, and in otherwise monitoring for us the completion of the Metrorail project. UMTA awarded the Morrison-Knudsen contract in October of this year. I would note that those in Miami that I have met with during this visit have been very, very cooperative in working with Morrison-Knudsen. A chronology of major events from the time UMTA was contacted by the IG until the present is attached to my testimony.

The construction management difficulties in Miami have caused UMTA to take a serious look at the issue of what is the appropriate role for UMTA to play in construction management oversight of federally funded projects. To assist the agency in determining what options are available to provide construction management oversight, a review was undertaken of the construction manage-

ment procedures used by UMTA and other Federal agencies in large construction projects.

We examined construction management practices and techniques utilized by other funding agencies that do not themselves carry out construction activities. Such agencies include the Federal Highway Administration, the Federal Aviation Administration, the U.S. Environmental Protection Agency, and the World Bank. Except for the World Bank, which works through foreign governments, all the agencies examined provide funds to local governments, either general or special purpose, who in turn contract with private firms for actual construction work. It is the local government that owns, and in most cases operates, the facility that has been constructed with Federal financial assistance.

In some instances, there are norms or standards which the funding agency mandates: safety, access for handicapped persons, utilization of minority contractors, compatibility with a national system, for instance, highways, and airways, and so forth.

A question both important and sensitive then is what role and what interest does the Federal Government have in overseeing such construction projects, be they wastewater treatment facilities, airport expansion activities, highways or mass transit construction. Our review concluded that the examined agencies were relatively consistent in the general way they saw the Federal role. The local government performed all direct and routine construction management functions; the Federal agencies endeavored to review the progress of the local governments to ensure that the Federal investment was being prudently managed.

Federal agencies, for example, did not generally monitor day to day construction work. But they did review progress reports, budget documents, quality control records and so forth, and conducted occasional site visits. The Federal agencies saw their role as oversight, not direct construction management.

It may be useful at this point to discuss the terms quality control and quality assurance, as they are constantly used in the context of this construction management subject, and the distinction between them is somewhat critical to a proper understanding of how a Federal agency can and perhaps should oversee construction activity carried out by its grantees. Quality control is a routine systematic procedure whereby steps are taken during a construction project—inspections, measurements, and testing of completed work—to insure that various phases of the activity are being built to proper standards and specifications. Quality assurance, on the other hand, can be described in a shorthand way as a subsequent audit of the quality control process.

It should also be pointed out that we do finance the quality assurance/quality control function of our grantees. To put this in context, normally 10 to 12 percent of total construction cost is for the grantee's construction management process. This cost generally includes all of the grantee's management process. This cost generally includes all of the grantee's activities related to control of the construction process. They begin when the construction is initiated. Initial design and procurement activities which take place before construction are not included in construction management. Forty percent of construction management cost typically is for the grant-

ee's quality assurance/quality control function, 4 or 5 percent of the total construction cost, whereas, the remaining 60 percent is for other activities, including administration, design support and contract monitoring.

I would now like to address the options that UMTA has considered to date and evaluated for handling the construction management issue.

The first of these would be to increase UMTA staff to perform construction management oversight. At the present time, as indicated this morning, UMTA has only 20 field engineers available to do construction management oversight. None of these individuals are assigned to construction management oversight on a fulltime basis. Carrying out construction management oversight with UMTA staff would require a very significant financial commitment to allow for additional staff and expanded duties. It would also require a significant and inappropriate increase in federal involvement at a time when, under Administration policy and the concept embodied in the recent Surface Transportation Assistance Act, grantees are being given more control over their projects. Therefore, we feel that this option would not be appropriate.

The second option we examined would be to use FHWA engineers to perform construction management oversight on UMTA funded projects. The FHWA has approximately 525 field engineers engaged in performing construction management oversight on FHWA projects, and they are working at near capacity now. Even if FHWA had additional capacity, the FHWA engineers are not experienced in all particular facets of transit construction, such as signaling, command and control, power distribution, and electromagnetic interference.

These are somewhat different functions from the construction elements of highway projects. Therefore, it would require at least the same significant financial commitment from FHWA to do UMTA's construction management oversight as it would for UMTA's engineering staff to perform that role itself. In fact, it might require more money to rely upon FHWA, since the entire staff would require training in the particular facets of transit projects.

It is my understanding that the FHWA is willing to assist UMTA in performing construction management in its area of expertise. However, with a 50-percent increase in its own program, resulting in a significant acceleration in construction and rehabilitation of the Nation's highways and bridges, the FHWA's first priority must be its own program.

The third option would be to use UMTA research and development funds to retain consultants to perform construction management oversight on a direct contractual basis with UMTA. This, in fact, is similar to the approach that we took in Miami where we hired Morrison-Knudsen, and that arrangement is working very well.

However, we view the situation in Miami as an exception, not one we consider a national model. We see several disadvantages to this approach. In our opinion, the R&D program at UMTA was not enacted by Congress to pursue this type of activity. In order to fund construction management under R&D, existing R&D funds

and staff resources would be strained, displacing activities on more appropriate R&D projects.

In addition, funding construction management oversight under R&D would give UMTA a greatly heightened role at a time when we are trying to give grantees more control over their programs. Let me add that it is an appropriate use of R&D funds for construction management and has been in the past to provide technical assistance to grantees in the form of guidelines and seminars, an activity which we are already undertaking.

The fourth option is to require grantees to use capital grant funds to contract with consultants to perform construction management oversight. That could be accomplished under the current UMTA program by making construction management oversight a budget and scope of work item in full funding contracts. One potential problem could be that of accountability in that the consultant would be paid directly by the grantee. However, I believe that we can impose sufficient contractual conditions, such as requiring an independent reporting relationship between the contractor and UMTA to guard against any such conflicts. As I have just described it, the fourth option would require the grantee to pay a 25-percent local share for construction management oversight.

I would like to turn now to construction management practices in several other new rail cities other than Miami. In all of these cities, UMTA has worked very closely with the transit authorities to set up construction management systems. The transit authorities in Atlanta, Baltimore, Buffalo, Washington, D.C., and Portland, Oreg. all use a combination of in-house personnel and consultants to perform construction management. I will briefly summarize construction management practices as they are ongoing in those cities.

In Atlanta, project quality control is carried out primarily through consultant provided resident engineers and inspectors. Quality assurance is carried out by the Metropolitan Atlanta Rapid Transit Authority Construction Division. UMTA's project management oversight of MARTA is carried out by the region IV staff, who review project plans and specifications. We are not aware of substantial construction managment difficulties on the MARTA project.

In Baltimore, consultants working under the direction of the Mass Transit Administration staff oversee the quality control contractors. Within that consultant's construction management team, a separate staff is set up to perform internal audits and inspector checks. UMTA's oversight of the MTA is performed by the region III staff. Their activities cover project design reviews, procurement, including construction bidding, progress reports, and quarterly project management reviews. The staff also reviews and monitors the grantee's proposed project management team, its organization, schedule, finance, project controls, and proposed quality control/quality assurance plans. Baltimore, too, has not experienced major construction management difficulties.

In Buffalo, the Niagara Frontier Transportation Authority performs quality assurance reviews in-house and uses a consultant for most quality reviews, and construction reviews. UMTA's oversight of NFTA is performed by the Region II staff. They, too, hold quar-

terly review meetings with NFTA to discuss progress as well as any financial or construction problems on the light rail project; we review NFTA's proposed change orders and approved change orders; and we make site inspections of key activities at the quarterly review meetings and when specific problems arise.

In addition, the regional staff receives information from the two New York State employees who are at the construction site at all times. UMTA also performs spot checks of construction records for the light rail project.

Buffalo has not experienced major construction management problems, although it has had two significant construction problems of which we are aware. The first was water infiltration in the main line tunnel. Although the cause of the problem is in dispute, NFTA proceeded to hire a contractor to waterproof the main line tunnel.

The second problem was that the thickness of the liner in the main line tunnel was not sufficient in some places. In the course of grouting the tunnel to repair the water infiltration situation, the contractor found insufficient thickness, tested the liner and repaired where necessary. The Department of Transportation's IG and the New York State inspectors also found some indications of insufficient thickness of the main line tunnel liner in other places. Corings have been taken and tested for thickness and strength. Repairs are being made as necessary.

In Washington, D.C., the Washington Metropolitan Area Transit Authority in-house staff includes two contracting officers and a construction engineer for each line. The construction engineer performs the quality assurance function. Periodically a WMATA management team consisting of about 10 people visits each project site to conduct an intensive construction management inspection/review. The quality control consultant has a construction manager who oversees three area managers, and all are in close contact with their resident engineers.

Field office staff consists of a resident engineer, one or two office engineers, and a number of inspectors which varies with the size and complexity of the construction element. The resident engineer performs the quality control function, can conduct spot inspections, and has a right to reject any construction materials not conforming to specifications.

UMTA's oversight of WMATA is performed by the region III staff. The oversight involves holding quarterly progress meetings with WMATA at which they review construction progress and discuss problems, if any, as well as any required corrective measures, receive monthly progress reports from WMATA, and conduct occasional onsite inspections. We are not aware of any substantial management difficulties at WMATA.

In Portland, Tri-Met, the regional transit authority, is constructing a light rail system. A significant portion of the project involves highway construction, and therefore is subject to the Federal Highway Administration's review rather than that of UMTA. The portion of the project that UMTA is overseeing involves about $100 million in construction, for track installation, signalization, electrification, maintenance facility construction, and vehicle procurement.

At the beginning of the light rail project, Tri-Met set up a special project management office. The project management office, headed by a light rail construction expert, has four supervisors, one for each line section. The office performs both quality control and quality assurance. The civil and system engineering firms on the project are also providing quality control supervision.

UMTA oversight of Tri-Met is performed by the regional engineer. The region X staff holds quarterly progress management meetings with Tri-Met, FHWA, and the Oregon Department of Transportation, at which they discuss Tri-Met's quality control and quality assurance efforts with the transit authority. The regional staff also reviews Tri-Met's monthly engineering reports. Those reports contain considerable technical detail, as well as project budget and schedule issues. So far Tri-Met, too, has not experienced construction management problems.

Mr. Chairman, I have fully reviewed the context in which UMTA's decisions on construction management oversight must be made and the options for handling those decisions. The question now is, where do we go from here? I believe that the situation in Miami is somewhat exceptional. I would note that UMTA has been providing financial assistance for transit for almost two decades. In that time, there has been approximately $18 billion in federally assisted construction, with few significant construction management difficulties.

However, based on the review we have conducted, some increase in the extent of construction management oversight activities on UMTA-funded projects may be warranted. But it is not a giant step that is needed now, and we should be concerned about overkill.

Therefore, I would not favor significantly increasing UMTA direct staff oversight or routinely using research and development funds to hire consultants on an as needed basis. Instead, at present I believe that we should continue to explore dealing with this issue through use of the existing capital resources, by requiring, for example, that grantees on major projects contract with consultants to perform construction management oversight from the beginning of the construction on those projects.

Thank you for the opportunity to discuss this issue with you. I would be glad to answer any questions that you might have.

[The attachment to Mr. Stanley's statement follows:]

MIAMI METRORAIL MAJOR EVENTS

Dates	Events
Mar. 15, 1983	Administrator (A. Teele) and executive director (R. Sander) advised by the DOT inspector general of potential problems of non compliance with contract specifications.
Mar. 21, 1983	R. Sander and staff (H. Evoy) met with R. Ravera and director of Transportation Systems Center (J. Costantino) to establish a DOT review team and prepare a statement of work for review of Metrorail project.
Mar. 23, 1983	A. Teele, R. Sander, associate administrator for technical assistance (P. Benjamin) and other URT/UGM engineers met with Miami delegation in Washington, D.C. Delegation was led by M. Stierheim, county manager; also in attendance from Miami were Dade County Commissioners, C. Oesterle, W. Higgins, B. Powell, H. Priluck, and W. Talbert.
Mar. 28, 1983	A Teele sent M. Stierheim a letter announcing the purpose of the DOT review team and a copy of the tecnical review plan.

MIAMI METRORAIL MAJOR EVENTS—Continued

Dates	Events
	R. Sander and staff (H. Evoy, W. Dougherty) travelled to Miami to meet with M. Stierheim and staff.
	Review team study was initiated on this date.
Apr. 13, 1983	R. Sander met with review team in Miami to discuss preliminary findings.
June 1, 1983	Review team's draft final report made available to UMTA officials for review.
June 2 and 3, 1983	Miami representatives H. Priluck and J. Crognalle travelled to TSC to review draft final report.
June 8, 1983	Miami delegation (Stierheim, Higgins, Priluck, Crognalle, Talbert) traveled to Washington to review draft final report (volumes I and II).
June 15, 1983	R. Ravera delivered final report to A. Teele.
	Miami Metrorail officials order county inspectors to tighten oversight of contractors and begin to staff up the quality assurance effort.
June 23, 1983	Official transmittal of Review Team's final report (Teele to Stierheim); 60 day requirement specified for Miami response to review team's findings.
June 24, 1983	Miami prepares preliminary response to review team's report transmitted by internal memorandum from Stierheim to mayor and board of commissioners. Preliminary Miami response also transmitted to UMTA.
Aug. 22, 1983	Final Miami response to review team's findings due in UMTA.
Sept. 1, 1983	Miami transmits response to Review Team's technical assessment, per agreement extending due date.
Sept. 22, 1983	Meeting at headquarters with senior Miami staff professionals and UMTA staff.
Oct. 10, 1983	Contract signed (letter contract) with Morrison-Knudsen (M–K) to conduct review and analysis of Miami's efforts to correct construction deficiencies.
Oct. 13, 1983	M–K on-site and initiates work program.
Nov. 12, 1983	M–K first progress report received by UMTA.
First week of November 1983	Planned December 18 opening date of Miami Metrorail postponed.

Mr. LEVITAS. Thank you very much, Mr. Stanley.

I would think it might be helpful at this point, looking at the areas we are going to get into, if we asked the Regional Administrator and Mr. Gene Carroll to join you up here. In case a question falls into their bailiwick for a response, it might just make it more convenient. So if I could ask Mr. O'Connor and Mr. Carroll if you all would please move up here.

If you would raise your right hands. Do you solemnly swear the testimony you will give before the subcommittee today will be the truth, the whole truth and nothing but the truth, so help you God?

Mr. O'CONNOR. I do.

Mr. CARROLL. I do.

Mr. LEVITAS. For the record, would you state your full name and your title?

Mr. O'CONNOR. I am the Regional Administrator in Atlanta.

Mr. CARROLL. I am the Director of the Office of Project Management in the Atlanta Regional Office.

Mr. LEVITAS. In your testimony, Mr. Stanley, you mentioned some construction difficulties in Buffalo, but no construction management problems of significance. You say, Washington, Baltimore, and Atlanta have not had major problems. I am going to ask our staff to check some of those situations out, but my question is this: Why has Miami been, to use your words, exceptional if not unique?

Mr. STANLEY. My understanding of the chronology in the Miami situation is this. In construction management, Miami initially did have a construction management plan, which our staff reviewed, and we had a peer review that was discussed this morning which

occurred very early in 1983, in which Gene Carroll participated. We reviewed what the construction management plan was, and based on those documents, we came to the conclusion that yes indeed, that plan was in place.

The distinction here concerns implementation of that plan—and I think the initial reports that we received from the IG and the concerns raised by TSC subsequently caused us to look further into the Miami situation—was that they were not implementing the construction management plan that was in place.

In the other regions, where establishment of a construction management plan is standard practice at the initiation of a major capital construction program such as a transit system, those construction management plans have indeed been implemented. There hasn't been the gap between the development of the plan and the actual carrying out of the plan at the local level.

I would say, too, that each of those areas has experienced construction difficulties. When I first came to Washington they experienced some great difficulties when they tunneled under the Potomac River. I believe the consultant at that time was a construction management firm, Bechtel, and those kind of construction problems have indeed occurred.

As I stated in my testimony in Buffalo, they have run into construction problems, in Buffalo.

The concern we have is that there is a construction management team in place that can deal with those problems as quickly as possible, and handle them at the outset, so that it is not a situation where the construction problem is either not detected or ripens to the point where the cost of repairing or changing the construction at that point in time is too high.

Mr. LEVITAS. Did the same persons have UMTA oversight responsibility in Atlanta as in Miami?

Mr. STANLEY. Yes, the same regional officers. There is a second engineer assigned in the regional office in Atlanta.

Mr. LEVITAS. Mr. O'Connor, does the same person—does Mr. Carroll do both of those?

Mr. O'CONNOR. Presently for the management oversight, he does.

Mr. LEVITAS. And how long have you been doing both of those, Mr. Carroll?

Mr. CARROLL. Five years.

Mr. LEVITAS. Do you see any difference between the way MARTA handles its, construction management responsibility and the way Metro-Dade——

Mr. CARROLL. They are organizationally different in the sense that MARTA has construction management done by the construction management division, with the audit function, to the extent that there is one, done by that construction management division of MARTA, while relying on consultants—the PBT group—to do the field work. Here you don't have quite the same organizational setup. In terms of philosophy and general procedures, they are about the same in both places.

Mr. LEVITAS. Is there anything in your judgment, Mr. Stanley, that UMTA could have done or should have done to assist the officials in Dade County, to avoid some of the problems that they en-

countered, such as the hammerhead pier problem on some of the others that were mentioned earlier today?

Mr. STANLEY. I don't know at what point in time UMTA actually knew about the design problems that are concerns between the design contractors and the actual construction firms. I regret that as much time passed as it did where we were in somewhat of an adversarial relationship with the Metro-Dade County Transit Administration.

I have talked with Clara Oesterle, the Commissioner, again today, and we have a common interest in identifying and correcting whatever construction deficiencies exist, and doing that as quickly as possible. I am confident under the leadership provided by Congressman Lehman that we have begun to work together and work much more closely than we had in the intervening months between the TSC report and the Dade County response.

Mr. LEVITAS. What about from your vantage point, Mr. Carroll? You were UMTA's man in Miami, so to speak, and we have heard some of the problems that they have identified in retrospect, some of the actions that they took, both in terms of how they segmented their construction, and then realized it would have been better to do it another way.

Then we have that design question and one or two others. In retrospect, do you see any place at which UMTA could have within its current procedures played a role that might have helped avoid some of those problems.

Mr. CARROLL. Could have played that role?

Mr. LEVITAS. Yes sir.

Mr. CARROLL. I guess in retrospect we could have jumped up and down on the hammerhead pier cap design, but to be truthful, we were not aware that there was a design problem, nor was Dade County, in my opinion, at that time. I think Mr. McDaniel said it was about mid-1981 that the problem first started to surface. It was reported to us—the hammerhead pier cap problem was reported to us in the project management meetings as being one of slowing down the pace of construction, not anything other than that.

The first time that we really realized that this problem was very serious was when the IG report—actually, the TSC report, I believe it was—talked about the hammerhead pier caps. That was the first time we realized that there was a very serious problem.

Mr. LEVITAS. I direct this question, I guess, to you, Mr. Carroll, and then also to you, Mr. Stanley. Maybe both of you can shed some light on it.

Let's take the other point that we heard earlier today. There was testimony that said, look, we now know that if we had to do it over again, we would have probably put the project out for contract in larger segments than we did, because we can get other people to bid and get more competition developed.

You have been working with other transit properties around the country, who presumably did it that other way. I think someone—Dr. Rowland, I believe—made the point earlier. To what extent do your good experiences and bad experiences, your observations of things that work in one community or don't work in another, to what extent are those made available to other UMTA clients?

Mr. STANLEY. We have had a fairly extensive program, again funded out of research and development training funds. We have had training seminars on construction management. We have had seminars with various assurance techniques. We publish guidelines on construction management in an effort to do just that, which is educate various grantees about experiences that have occurred in other areas of the country.

With regard to design, we don't at this point in time approve or disapprove of whatever kind of design, or engineering, a grantee chooses to pursue. I think from a grantee's perspective, the competition for the limited capital resources that UMTA can provide for the construction of major systems causes them at the preliminary engineering stage or the design stage to try and make sure that the design and construction is on budget, and is as cost effective as possible.

The other difficulty I have seen, mostly on new starts, is the uniqueness of design, which is unlike federal highways, which I understand has their own specifications for what is an interstate bridge and the kinds of general standardized specs that can be applied to any bridge anywhere in the country. I think the uniqueness of where a transit project is going to go through an urban area, how much land is available, right-of-way questions, cause a much greater variety in the kinds of design and imaginative engineering as they bid on specific projects. One of the concerns I have had is they have varied so greatly in terms of choosing light rail, heavy rail, going underground, whether to use a hammerhead pier cap or three piers to hold up the system, whether it be elevated or at ground level.

That variety I think is a bit of a constraint on UMTA to come up with specifications that are as standard as Federal highways in construction.

Mr. LEVITAS. I have three more questions at this time. In our staff's preliminary investigation, which was reported to me, we have heard the statement from at least one experienced UMTA official, who as you will soon realize must remain nameless, that all UMTA does is—and I quote—"shovel out the money and hope for the best."

Would you comment on that, please, Mr. Stanley, and also share with me your views as to whether you think the UMTA program is a categorical grant program or a block grant program or some sort of revenue sharing program?

Mr. STANLEY. My view of the UMTA program is that we provide capital assistance, and I would hope to the most eligible projects.

Let me first address the issue of new starts. My principal concern—as I testified at my confirmation hearing—is that we take a hard look at the cost effectiveness and other criteria that are provided with our appropriations act before we make the kinds of major capital investments that the eligible cities like us to make, and we hold them to a very high standard in meeting cost effectiveness, total financial share, and ability to construct the system and to operate the system.

I have heard the criticism of UMTA that all we are is basically a revenue sharing program. One of the accomplishments, I think, in the Surface Transportation Assistance Act is that we have gone to

a formula grant approach, a one-time apportionment for our section 9 funds. This allows the grantee considerable independence and authority in choosing what projects those funds are going to be applied to.

I have great concern, as I begin my role as Administrator, to make sure that we don't just continue to write checks to projects that may be questionable, or where there are constant cost overruns, or where the construction has proven faulty, and that we, in terms of the Federal financial participation we provide, are assured as much as possible before we sign a full funding contract that grantees have the capability of carrying out the terms of that contract.

The difficulty at times is that a lot of these projects have been funded for a number of years, with significant federal financial commitment in them. However, issues of construction quality have been raised at a point in time later than I would prefer.

Mr. LEVITAS. The last question at this point is this—and it is something that several of us have expressed concern about today, and I guess I more than anybody else—and that is: Can we rely on the work that TSC performs, or is it so subject to question, as the officials here in Dade County have questioned it, that we are wasting the taxpayers' money even supporting such an operation?

I used the GAO analogy earlier. I don't accept everything that GAO says. I know when they write a report about some agency, people in that agency often will say GAO didn't know what it was doing. But I think, by and large—with some exceptions—Congress relies to a pretty large extent on what GAO tells us, the same way we do with the Office of Technology Assessment, and some of the other agencies which we believe to be objective, professional and independent.

And yet, here we have a situation where, as I have pointed out several times, the public has invested $1.5 million or more in consulting reports of one form or another, talking about historical defects or minimizing those alleged defects. Now a new player comes in, other than the Federal Government, as an objective third party, and we are going around again.

In your judgment, is TSC doing the type of job that we in Congress expect them to do, and you at DOT expect them to do; or do we need to make some changes there so that they can do that job, or should we get rid of it?

Mr. STANLEY. Mr. Chairman, I have been at the department now for close to three years, and I am familiar with a wide range of reports and efforts that TSC has undertaken for modes other than UMTA, and I think they have done a credible job.

With regard to the specific involvement in the Miami area, that was a decision by the previous Administrator. It was subsequent to the first notice from the Inspector General's office that there were concerns in Miami, and TSC, I think, spent only 60 days down here, and the report that resulted was not the result of a year-long investigation. Of the funding that we paid TSC for it—it was approximately $450,000—$300,000 of that went to consultants that TSC made part of their team as they prepared that initial report. And there was, I sensed, some more urgency based on the interest

generated here when the word became public that the Inspector General was inspecting construction deficiencies.

And TSC's report was as thorough as I think could be done at the time. There have been questions, and I have talked with the Dade County officials about how the response was handled and their ability to rebut some of the presumptions which led to conclusions in the TSC report may have been handled a bit better. But, all in all, the work I have seen TSC perform in the department has been credible.

As for the Morrison-Knudsen contract, I was in UMTA when we signed that letter contract in October, and their purpose is distinctly not to publish another 10-volume report which says TSC is right, and Dade County's consultants are wrong, but rather to maintain a presence here in Dade County that monitors what the initial concern was—which was not that there was not a construction management plan, but that the construction management plan was not being implemented. And when Dade County, working closely with people from Morrison-Knudsen and from UMTA, identifies that there is a construction deficiency that they can all agree upon, that steps are taken and implemented to correct that as quickly as possible. I wish we had gotten that process underway back in the spring.

Again, I think Buffalo—I have talked with Congressman Nowak about that—when we identified certain construction problems that arose in that contract, was very, very cooperative initially. We are working very closely with them, not in an adversarial way, but basically to say, yes, we can verify that these construction deficiencies exist; and both of us have an interest in correcting them as soon as possible. I think that is the way the relationship between UMTA and Dade County is now.

Mr. LEVITAS. I accept that. But I am still not sure I understand what you are telling me about TSC, and in particular the report they did on Metrorail in Dade County.

Was it a hurry-up, shoddy job? Or is it something that you feel is substantially correct? Or did somebody at DOT not give appropriate direction or resources or time frame?

We are an oversight committee of the Congress, and we have got to look at material generated for us by people upon whom we have some reliance. Obviously, the people we first turn to are the agencies of government, and those who supply information to those agencies, which in turn comes to us. Therefore, it is critically important that we have some understanding of whether you think TSC fouled up.

Did they provide a good report or not? And if not, why not? And should we be asking some questions at DOT as to the reliability of TSC, because, without that, then we are tremendously handicapped in performing our responsibilities?

Mr. STANLEY. With regard to the TSC report, again I would have preferred, I suppose, that we had known earlier that there were concerns about design and construction, and that TSC had more time.

One thing I was going to point out is that the recommendations included in the TSC report—namely, that the quality assurance, quality control program be implemented—was based on not an

overall survey of the entire project, but where construction deficiencies existed. TSC urged that there be greater steps taken to assure that whatever construction management program was in place was implemented.

Subsequent to the issuance of that report, those are the very goals and recommendations toward which Dade County, in cooperation with UMTA, are working. So I think whether or not there was a cause and effect relationship of TSC having raised and published concerns, and now Dade County working with us are attempting to address those concerns, and progress is being made, I think that is a substantial benefit to the TSC report. But my review of it and recommendations contained in it——

Mr. LEVITAS. I am sorry?

Mr. STANLEY. Not that there is anything shoddy about it. They did have a limited time period in which they were asked to review the project here in Miami and report back.

Mr. LEVITAS. Are you satisfied with the TSC report?

Mr. STANLEY. I am satisfied with the TSC report, yes.

I also wanted to let Bob McManus address that, who has worked very closely as the lead person at UMTA during preparation of the TSC report.

Mr. LEVITAS. Mr. McManus.

Mr. MCMANUS. I think the TSC report, and then their follow-up advice to us, has been very helpful in working with Dade County, with the County Manager and his staff, in bringing about a constructive resolution of the problems down here. Following their report and the Miami reaction to it, we tried to hone in——

Mr. LEVITAS. Let me interrupt you right there. I don't recall the exact words, but I think I have got a pretty good recollection of it. I think it was Mr. Stierheim who was quoted as describing that report as a hatchet job.

Mr. MCMANUS. Yes.

Mr. LEVITAS. Now, it doesn't sound like you are describing that same situation to me. I was looking at their report, the Metro-Dade Transportation Administration's report, and among other things they say that, "The vast majority of TSC concerns observations are so insignificant that little, if any, corrective action is required." And, "The quality assurance oversight program had already begun."

They make the point that if TSC had bothered to talk to them or look in their files, they would have found out things that were already being done, that they had reported on. Out of 247 TSC observations and concerns, it will cost $62,000 to repair those items, requiring any level of remedial action regardless of who found the deficiency, they said, and out of the 247, only 8 require more than minor remedial action.

There was clearly a difference of opinion between the Metro-Dade Transportation Administration and TSC.

Mr. MCMANUS. Yes, there was.

You mentioned this morning defensiveness on the part of the Dade County people. I think perhaps the reaction to the report was an overreaction. TSC did not list 247 things to be corrected. In fact, things that they were looking at were, in most cases, things that were brought out by the Dade County staff earlier.

TSC went down and investigated further, looked at construction records, looked at the logistical support for inspectors, and the attention given to inspectors' reports and comments on the construction records, things like that, and their principal recommendations, their general recommendations were that, in view of those general observations, that some effort be made to look further in the system to see whether there were other places where similar conditions might be found other than what Dade County itself had discovered.

By my comment, what I mean to say, Mr. Chairman, is that I think that TSC gave us very good support, and we were able to rise above, in my opinion, this point and counterpoint situation with Dade County and worked out an understanding that we would retain a third party, in this case Morrison-Knudsen. We could very well have continued that role with TSC, the Morrison-Knudsen role, but we retained a third party. But we followed up in the task statement with Morrison-Knudsen the very things that TSC advised us would be helpful in coming to a constructive resolution of the problems, and that is the way it is working out.

Mr. LEVITAS. Thank you.

Mr. Molinari.

Mr. MOLINARI. Well, let's start off by asking, why was Morrison-Knudsen retained?

Mr. STANLEY. If I can answer that, I think in the wake of the controversy and the history from the point in time in March, when the I.G. first gave UMTA evidence that it was looking into certain construction deficiencies, to the differences of opinion we had with Dade County over the summer, we decided that we would try and choose an engineering firm that had had construction experience on projects of this size and scope. They would be from this point in time to the completion of construction our eyes and ears down here in Dade County, to insure that further construction and any deficiencies that had been identified were corrected and completed in accordance with the construction management plan. That was a decision that we discussed, as I understand, with Dade County officials, and that they agreed to.

As Merrett Stierheim testified this morning, the Morrison-Knudsen man is in on the staff meetings, has full access to records involved, has an independent reporting relationship to UMTA. I feel we are beyond the sort of "TSC is right, Dade County is wrong" stage of the process.

One other point. When the concerns were first raised, the rail project wasn't complete. There is a significant amount of construction left. It is not uncommon for construction problems to arise that are all correctable, and TSC as well as Morrison-Knudsen have both said to us that any of the problems they pointed out were correctable.

It is just a matter of identifying and fully documenting those problems to the extent they exist, to the full extent they exist, and taking steps to correct them.

So there is nothing that I have seen that is irremedial in terms of the construction of this project, and we are in a very postive relationship and on the course in correcting them. Morrison-Knudsen

has provided very valuable assistance both to us and Dade County in that regard.

Mr. MOLINARI. There doesn't seem to be any question about the fact that Morrison-Knudsen is held in high regard both by UMTA and by the Dade County people, which is certainly one step in the right direction. But after we leave here, and after this job is completed, the Public Works and Transportation full committee, and possibly our subcommittee, may have to deal again with TSC.

Obviously, the credibility of TSC has been questioned quite severely by this 10-volume work, and the question I have is, will the money being paid to Morrison-Knudsen lead us at the end to any conclusions as to whether TSC's report was accurate or inaccurate?

Mr. STANLEY. One of the first projects in the Morrison-Knudsen letter contract is to review both the TSC report as well as Dade County's reply, but not to prepare an 8-volume report as to 247 points and who is right and who is wrong.

I would not favor them sitting off in an office with $1 million worth of reports and trying to come up with another $500,000 worth of reports as to who is right and who is wrong.

Mr. MOLINARI. I sure hope, if you will permit me to interrupt, that we don't see this project completed without some kind of evaluation. I for one don't know whether the testimony of TSC could be accepted in the future on any other job. It has been seriously questioned here. I am not trying to prolong the agony that the local folks have dealt with for too long, but speaking in futuro, to those of us that do have to deal with the TSC, their reputation has been brought into question.

I am concerned as to whether there will be an evaluation of their report to any reasonable extent, so that we have a third party saying to us they are off the beaten path, or they were on course, but they might have made several mistakes here, there, or everywhere. It concerns me. I don't think we can leave it at that point.

Mr. STANLEY. I understand your concern, and share that. My experience with TSC from the Secretary's office is they have provided us with very, very credible reports. If you break down the TSC contract—I wasn't there when TSC made its decisions as to who would be on their project review team, who they would include—they had some people from highways, UMTA participated, there were representatives from the I.G.'s Office, and $300,000 of the $450,000 that UMTA paid TSC went to outside consultants. That may have been a result of a desire because of the public interest, once the word broke publicly that the I.G. was questioning certain construction aspects of the project, to come up with as quick a review as possible.

And, again, the purpose of the TSC report, as I understand it, was not to come up with conclusions about problems that couldn't be corrected. They were careful. I think they didn't question the safety of the system, and they did say that, based on our review, we have identified certain components, certain construction deficiencies that would merit further investigation.

I wish at that point in time we could have sat down with Dade County and perhaps it could have been handled a little bit better. I know there were some concerns expressed here when the press obtained a copy of the draft report prior to Dade County having had

an opportunity to reply either to TSC or to us to some of the preliminary conclusions, and perhaps that could have been handled better. But, again, I would stand by the credibility of TSC, based on my experience.

Mr. MOLINARI. Have they performed similar evaluations on other projects in the country that you are aware of?

Mr. MCMANUS. No.

Mr. MOLINARI. They have not?

Mr. MCMANUS. No. They have advised us primarily in our research and development program, and we have had long experience with TSC in the UMTA program, but this is the first time that we used them directly in construction management problems.

Mr. MOLINARI. The question was raised as to whether somebody performing an overview should not have consulted with the local officials before completing their report. They could have said the same kinds of things, but perhaps at least listened to the other side before making final determinations. I think it would have provided better balance, and I am just wondering why that wasn't done, whether it was standard operating procedure. We are told, now for the first time that they did this kind of work.

Mr. MCMANUS. Yes, but I think TSC folks would say that they felt they had talked with local officials here. That was one of the points of contention. The TSC comments to us and the Dade County comments never did jibe on that question of consultation.

Mr. MOLINARI. Let me turn quickly, if I may, to another question. We have heard conflicting views on the question of whether the architectural engineering firm, the design engineering firm, should also handle construction. It seemed to be the feeling of the Dade County people that that is not a desirable practice, and the chairman brought out a copy of the Engineering News Record which showed just the opposite.

In your experience, both at DOT and during your short tenure at Urban Mass Transportation, do you have any feeling as to which would be a preferable procedure?

Mr. STANLEY. I wouldn't want to substitute my own judgment. I am not an engineer nor have I witnessed one of these projects from beginning to end. But my concern on a generic basis is allowing a firm responsible for design, and also responsible for the construction, to do the construction management oversight function. I would not advocate that.

I have talked to several major construction management firms that are of the size and stature of Morrison Knudsen, and one of the questions I asked them this past week is: Would it put you in an awkward situation if you were a consultant performing construction management oversight basically to critique either your competitors or other firms that you may have bid against and lost on a project? And the answer I got back was "No."

And the case in point that I have talked with Bob McManus about was in Baltimore, in the 1970's as I understand it, where there was a firm that was doing construction management oversight that was a competitor of the construction management firm. The oversight firm pointed out that they didn't think the construction management was being adequately handled, and the construc-

tion management firm replaced their whole staff there, based on that kind of criticism.

But in terms of the design firm, I think a firm responsible for the design, particularly one that may be as controversial or as unique as the one we heard about this morning with regard to the hammerhead piers, has to defend that design. I don't know if that is the best firm to have the oversight responsibiltiy as to whether that design is indeed constructable.

Mr. MOLINARI. Maybe, if they were to handle construction they would have been penalized by their own design as well?

Mr. STANLEY. Right.

Mr. MOLINARI. If what we have heard today is correct.

Can you just tell the subcommittee how the full funding concept has changed, or what it is today?

Mr. STANLEY. As I understand it, the full funding contracting procedure, at the very initiation when we commit to a major capital investment such as the system here in Miami, is done as a result of an alternatives analysis that takes place at the local level so that they can come up with exactly what kind of transit system best meets the needs of that area.

There is preliminary engineering that has been done, design work that has been done, and at the point in time in which we enter into a full funding contract, we give the full scope of what the Federal funding commitment will be, a schedule of those payments, certain requirements in that full funding contract as to exactly what we are buying for that amount of money, the length of the system, the extent of the system, how it is planned and laid out, as well as their compliance with applicable Federal statutes, environmental statutes, the MBE requirements, and the review procedures that we have as to project management guidelines which are incorporated by reference in that contract. The grantee is then responsible, working under that full funding contract, for seeing to it that what they have contracted for is actually built and constructed.

Any amendments thereto have to be approved by UMTA. They can't go out and change the scope of the plan, exactly what the project will entail, other than certain extraordinary costs such as those for inflation rates and any particular concerns that come up where we can amend that contract.

Mr. MOLINARI. Part of that concept, though, is to put a cap on the federal amount being expended on that project?

Mr. STANLEY. Yes.

Mr. MOLINARI. We saw the chart that the Dade County people brought here before, and I think there were some $680 million dollars that is the Federal share. We saw the State's share remaining constant at 10 percent. We saw the local share somewhere around 20 percent, and I assume that is an example of the full funding concept.

Mr. STANLEY. Yes.

Mr. MOLINARI. The other problem, one that the chairman and I have discussed briefly and which I think you alluded to before in your opening statement: it becomes somewhat important that cost controls be built in. I think the overruns here have been amazingly

low, if they have been at all, but we hear horror story after horror story about projects that have doubled in total cost.

Historically, if the Federal Government could be looked to pick up 80 percent of the overruns, you could rest assured there are going to be overruns, because it is a nice way of providing a jobs bill for local areas at minimal expense to those local areas. But it also places a greater burden on you in making sure that the contractor is going to be able to perform for the amount expressed, or if there are going to be cost overruns, that that money is going to be provided for either by State and local government or both. How do you deal with that problem?

Mr. STANLEY. I think we have talked about it often at quarterly progress meetings we have at the regional staff level, and the principal subject at that point is to have reports back from the grantee that they are on budget, on schedule, that they haven't experienced any major budget problems.

I think our principal concern in dealing with UMTA's history as a financial assistance agency is that within the context of those full funding contracts, we will meet with them four times a year to assure that there are not significant cost overruns, that they haven't run into real construction delays, and that they particularly are staying within the letter and the amount indicated in that full funding contract. Should they desire to increase the amount of Federal funding at that time, that is a significant amendment to that document, and I would look with real scrutiny at a grantee's request for a major increase in the full funding contract.

Mr. LEVITAS. Will you yield at that point? Do any of you know what the original estimated cost of the people mover, or whatever the term is, was supposed to be?

Mr. CARROLL. Well, it has a whole series of original estimates, but there was at one time a $96 million cost estimate. You might want to get that confirmed from Dade County.

Mr. LEVITAS. How about $24 million?

Mr. CARROLL. Well, that was a number that was politically originated. It was discussed at one time, but it never was a realistic number. It was supposed to be $24 million, if they could get it down within a certain sale for the rail and DPM.

Mr. LEVITAS. According to my information, at one time, to be specific May 1979, the proposal for the people mover was estimated to be $24 million.

Mr. CARROLL. I guess what I am saying is I don't think anybody on UMTA's side of the house seriously believed that number.

Mr. LEVITAS. And what is the present estimated cost of the people mover?

Mr. CARROLL. It is $132 million.

Mr. MOLINARI. Mr. Chairman, I think at this point I would like to yield to my colleagues in fairness, although I have a couple of other questions I would like to ask.

Mr. LEVITAS. Thank you very much, Mr. Molinari. Mr. Rowland.

Dr. ROWLAND. Thank you, Mr. Chairman.

In your testimony you state that it was UMTA's determination to bring in Morrison-Knudsen, and you referred to this a few moments ago, but Dade County was also involved in the decision to bring in this consultant firm. Is that correct?

Mr. STANLEY. Yes, that is correct.

Dr. ROWLAND. Can you tell me how it is costing to have this consulting firm, and where the money is coming from to pay them?

Mr. STANLEY. The money that we are paying Morrison-Knudsen is coming out of our section 6 research and development and section 8 planning and technical studies accounts. To date, the letter contract we signed with them in October is for $450,000, or $475,0000, and I think approximately $190,000 has been drawn down so far.

Dr. ROWLAND. Has there been any other outside consultants employed in this particular project?

Mr. STANLEY. By UMTA?

Dr. ROWLAND. Yes, by UMTA.

Mr. STANLEY. No, sir.

Dr. ROWLAND. No others. Whose decision was it to turn to TSC when they first came in? Can you tell me where the money came from to pay them and how much that cost?

Mr. STANLEY. The decision was made by the former administrator, Arthur Teele. The contract, the funds expended at TSC totaled $450,000, 300 of which went to outside consultants, 150 to pay for staff and the time of TSC, and those funds I believe too came out of Section 6 research and development.

Dr. ROWLAND. Are there any former UMTA officials now employed in Miami since they left UMTA?

Mr. STANLEY. There are three former UMTA officials, two of whom are employed by the Metro-Dade Transportation Administration, I believe, and one of whom had worked for the Kaiser Transit Group as a design project manager.

Mr. MCMANUS. Chief of engineering and design.

Mr. STANLEY. Chief of engineering and design.

Dr. ROWLAND. Can you tell me what UMTA's position was when the county decided to take over construction management from KTG in 1981? What was the position on that?

Mr. STANLEY. Again, my understanding is UMTA did not object to that, and as I indicated in the testimony, other transit authorities have significant in-house construction management responsibilities. At the time—and I defer to Bob McManus as well—we didn't object or take a formal position objecting or affirming that decision made by Dade County.

Mr. MCMANUS. I would just add that we could presume that that transition would work out pretty well, based on just the general standing of Dade County as a county government. It is regarded as a well administered municipal government in public administration circles, so we would have felt every confidence that that transition would work out well.

Dr. ROWLAND. In 1981, when there began to appear some controversy and alleged construction deficiencies, do you think that you became involved early enough and aggressively enough, DOT and UMTA?

Mr. STANLEY. The dates with regard to UMTA's involvement, other than the fact we participated in the peer review that was conducted in January and February 1983, really were subsequent to the March 15 notification from the Inspector General that there were concerns about construction deficiencies.

In hindsight, I listened to the testimony this morning, and the first concerns about the actual design problems with regard to the hammerhead pier caps were in late 1982, and I would suppose it would have been much better had UMTA known a bit earlier.

I am sure that Dade County also would like to have found out as much as possible as soon as possible to have prevented the sort of late entry into addressing these problems.

Dr. ROWLAND. Well, insofar as those things, like the hammerhead pier cap that we talked about this morning, and the charge that it was overdesigned maybe, did UMTA have any role in looking at that when it first came about? You didn't make any decisions about it?

Mr. STANLEY. No. We don't approve of design plans for any part of the transit system.

Dr. ROWLAND. Retrospectively, do you think that you should have been involved more than that or do you still think that—

Mr. STANLEY. Based on my acquaintance with UMTA, we simply don't have the design expertise to have made a credible judgment, and as I listened to the testimony this morning, I am sure there are design and architectural experts who would testify to the adequacy of that design. My experience is UMTA does not have, and at that point in time wouldn't have had the definitive expertise to say yes or no to that design.

Dr. ROWLAND. One other question, Mr. Chairman.

You mentioned some of the options that UMTA might have in handling construction management issues. Would you care to elaborate on what you think might be the best way to go?

Mr. STANLEY. My sense of the best of the options we looked at to date is that at the point in time we enter into a full funding contract with a grantee for a major transit capital investment, that we set up some sort of independent reporting function through a consultant, I think, because our needs for engineers vary from time to time.

We are in the midst of a lot of new start construction right now, which wasn't the case several years ago, and as those areas like Dade County get more and more familiar with these issues, the need for our oversight I think would go down a bit. I would note that in the old rail cities, New York, Pittsburgh, Boston, Philadelphia, they have had construction management and they have been maintaining those systems for decades now, and they are very, very experienced.

And as to our oversight function, there doesn't seem to be as many problems as have arisen in some of the new start cities. My sense is if we are going to begin a major investment there is a reason to take a hard look, very specifically up front in entering into the full funding contract, at whether we should require construction management oversight provided by an independent consultant that would report directly back to UMTA, so that we would be able to ask some of the kinds of questions that we are asking here, but asking a little bit late in the process. This could occur at the very outset. I think that could be funded out of existing capital funds that we provide.

Dr. ROWLAND. To go back to a question that I asked earlier, and that the chairman referred to, on future projects, what has been

learned here; do you think that you, UMTA, will be able to become more involved in helping in other areas around the country in avoiding this kind of problem?

Mr. STANLEY. Absolutely. I talked to a number of the transit officials in other new start cities. I have said that the problems Miami has experienced, based on Miami's progress and construction, provide tremendous lessons to be learned by a city about to initiate that kind of construction, and that these construction concerns aren't unique to Miami.

But at the outset of one of these major rail projects these kinds of issues deserve scrutiny and attention as early in the process as can be provided. This is a priority of mine for any other full funding contracts that we enter into in the course of my tenure as administrator. This is a priority concern of ours.

Dr. ROWLAND. Certainly they are not unique to Miami. I am sure that problems come up all over, and that if you were able to combine them into one package, so that they could be available to other cities contemplating construction, that would be very useful. Thank you very much.

Mr. LEVITAS. Thank you very much, Dr. Rowland. Mr. Nowak, the gentleman from New York.

Mr. NOWAK. Thank you very much, Mr. Chairman.

In your testimony you conclude that you would favor, and I quote, ". . . that we should continue to explore dealing with this issue through the use of existing capital resources by requiring, for example, a grantee on major projects contract with consultants to perform construction management oversight."

That, and your colloquy a moment ago, seem to indicate that especially on those new projects that are coming into being, where there is uniqueness of construction as opposed to an extension or a rehabilitation, you would find it valuable to institute that right from the beginning; is that correct?

Mr. STANLEY. Yes, it is.

Mr. NOWAK. The older rehabilitation projects, such as in New York and Chicago, I would assume, seem to be relatively simple when compared with the elevated guideway design and components that are both unique and, as we have seen, controversial.

I am wondering if the TSC people—I guess somebody mentioned here they didn't have a lot of experience in rail transit work, construction rail transit work analysis prior to the assignment of this project; is that correct?

Mr. STANLEY. To my knowledge this is the first time we have asked them to enter in and make a judgment about an ongoing local construction project.

Mr. NOWAK. Do you know what type of projects they have been familiar with?

Mr. STANLEY. They have worked in the past, according to my recollection, on the transbus issue that was examined in this committee's report in 1980, and some rather interesting but unproven transit technologies such as designing a better bus and designing a more efficient railcar. These are more speculative than situations where there is a market, where there are grantees that are willing to buy——

Mr. NOWAK. Were they involved in other construction projects?

Mr. STANLEY. To my knowledge, no, not on construction of highways or airports or ship construction in the Maritime Administration.

Mr. NOWAK. I see. Of the deficiencies that are outlined, one in particular refers to the mislocation of reinforcing bars in the hammerhead pier caps. Do we know or does anybody at the table know, is that a major kind of deficiency that would cause particular safety problems in that system?

Mr. STANLEY. As I understand it, TSC in its report, as well as Morrison-Knudsen, have indicated there is nothing that has come up that is questioning the safety of the system. On certain of the hammerhead pier caps that were examined, it is TSC's conclusion that reinforcing steel alinement that we saw this morning, although that may have been the perfect design around which concrete can be laid, in certain instances there are indications that that steel wasn't alined that way.

But how extensive that is, and exactly what kind of problems would arise from that hadn't been concluded. And in fact it is my understanding that two pier caps have been tested so far, stress tested, and both passed the design specifications.

Mr. NOWAK. Is Morrison looking into that further to try to confirm that?

Mr. STANLEY. Yes.

Mr. NOWAK. Are they actually doing field testing?

Mr. CARROLL. No, they are not doing field testing. They are monitoring the testing that is being done by Dade County. As a point of clarification, the misplacement of the steel at the time of the TSC report was such that TSC only recommended: Look, the steel is not as it was designed. Please take a look at it. And subsequently——

Mr. NOWAK. So they drew no conclusions?

Mr. CARROLL. No.

Mr. NOWAK. As to it being that far off of spec that it could cause a problem and so forth, they just made the statement?

Mr. CARROLL. Right.

Mr. MCMANUS. And they said that the deficiencies might reduce the load-bearing capacity or the service life of the guideway, statements of that nature.

Mr. NOWAK. There is no question in your mind that the Morrison firm, however, could resolve the concerns that were stated by TSC and then carry them further to conclusions about safety factors, or if there were variances from the specs that would have material differences in stress factors and so forth; is that the kind of finality that we will get out of Morrison?

Mr. STANLEY. As I understand it now, the field testing is being conducted for Dade County by the Raths, Raths & Johnson engineering firm. Morrison-Knudsen is monitoring it, making sure the testing occurs, and making sure that the testing is in accordance with industry standards.

Mr. NOWAK. Morrison will issue their own report based upon what they have observed?

Mr. STANLEY. They have provided us with weekly progress reports since they have been down here. Again, Dade County and Raths, Raths & Johnson and Morrison-Knudsen are all operating in the same direction.

Mr. NOWAK. Morrison has had some construction experience?

Mr. STANLEY. Oh, yes.

Mr. NOWAK. Over the years?

Mr. STANLEY. Extensive construction.

Mr. NOWAK. I just think your conclusion in your statement makes a lot of sense; where you have specific problems like this I think you are well advised to go out to a firm like Morrison, which has the background and the experience and the credibility, and try to bring these things to a conclusion as soon as possible.

On so many of these Federal construction projects, you look at the difference in costs like that of the DPM rail system that was brought up here that starts out at $24 million or $96 million, as the case may have been, and now is $132 million, and you say, well, what is going on there? Time just eats that up. Nobody takes into consideration the increases in all the construction materials on down the line after the initial planning of those projects.

We have one in New York in particular, and Mr. Molinari is very familiar with it, a little highway called Westway.

Mr. MOLINARI. I am opposed to it.

Mr. NOWAK. That has been in the planning stage for many, many years. When we look at other projects that have been held up and then are finally built, you see that it happens at about two or three times the price. So hopefully we can move this along.

To move in as you have, and bring on board this kind of credible firm, provides the evidence that you can reach a conclusion and move on. Otherwise you could stay deadlocked for an awful long time and accomplish very little. And those prices continue to rise. I appreciate your testimony and even though we are not in Washington, welcome before the committee.

Mr. STANLEY. Thank you.

Mr. LEVITAS. Thank you, Mr Nowak. Congressman Lehman.

Mr. LEHMAN. Thank you, Mr. Chairman, and thank you, Mr. Stanley, for being here today. I want to wish you a lot of luck. Maybe I will have just a little advice to give you based on long-time experience in business as well as in politics. You are going to be dealing with an awful lot of money, whether you want to or not.

Over the next few years you are going to be handling $400 million for new starts more or less each year, $500 million in rail modernization, both of those out of discretionary money. You are going to have $200 million to deal with for the Washington Metro. You are going to have at least $400 million to deal with in interstate transfers to transit systems, and maybe you will have a few hundred million going out for other capital improvements. Somewhere between $1.5 and $2 billion in money going to new systems or extensions of old systems.

Now, power and authority is never handed to anybody. You are either going to assume it or somebody else is going to take it from you, and my advice to you is to assume the authority that goes with your office and be responsible, as you should be, for this money as to how it is going to be spent. I see just from our appropriation bill last year the following cities are already involved in new starts or extensions: Portland, Baltimore, Detroit, Miami, Santa Clara, Atlanta, Los Angeles, Houston, Jacksonville, San Diego, St. Louis, San Francisco, Chicago, Sacramento, and Boston.

Now, that is a lot of places, and there may be new ones that you haven't heard about yet probably. I haven't even mentioned Denver, and they may be coming at us next year, and I think that the only way that you are going to be able to effect what you said on one of the pages in your testimony—that is, look at what is going to be the most cost effective—is to get in at the ground floor and determine what kind of designs you are going to approve, and to get the capability in your agency, in your administration, to determine what is a cost-effective design, and how best to spend the money. There is no basis to assume that every one of these cities—is going to have the capability to be able to spend this money well and to be sure that the public is well served by the money that is spent.

It is just too much money going to too many places, without any central control, and I think it is time for your agency to assume this responsibility. It doesn't make any difference whether you hire engineers or whether you hire the various independent consulting firms to do it, or whether you go with the Federal Highway Administration.

You say in your statement that the Federal Highway Administration does not have the capability to do this kind of job because it isn't able to do the kind of work done required for a mass transit system, and yet the Federal Railroad Administration has contracted with the Federal Highway Administration to provide engineering support for the $2.2 billion Northeast corridor improvement project, and that is certainly not exactly within the normal purview of the Federal Highway Administration.

What you really have in Miami, is nothing less than a 20-mile bridge, and the Federal Highway Administration certainly can be of help in overseeing this project.

What I want to see happen—and it will make my job a heck of a lot easier—is for UMTA to assume this management responsibility. I think you are capable of doing it, and I think you are the type of person that can do it and still get along with the people that you have to live with and do business with very day, whether it is in Miami, San Francisco, or wherever.

It is going to make your job easier, and I think that is the main thing that we have learned today. I don't want to go back and talk about whether TSC talked to Metro Dade or whether Dade Transit talked to TSC or whether the Metro Mover is costing $24 million or $134 million. That is water under the bridge. Let's go forward from now and do the thing right.

I only have one last question to ask you. I think it is the most important question of all to us in Miami. You sat there patiently and listened for 4 hours without saying anything to the people who testified under oath for Metro. I would like to know whether there is anything that they said that you pointedly disagree with, because I think it is the main job of this group now to know where you and Metro disagree.

Mr. STANLEY. I have been on the job as UMTA administrator for about a month, and this has been one of my primary concerns. I have talked to people from Metro when they were in Washington; I think we have got a very close working relationship.

There are no specific links in there that I had great disagreement with, but I would like to tell the committee that I am confident, based on my discussions with the county officials, that we are going to be working very closely to resolve whatever problems are outstanding, and do so before the project is completed.

Mr. LEHMAN. I am very pleased to hear those remarks, and I hope you will listen to my advice and make my job easier. I will yield back the balance of my time. I want to thank the chairman and the members of the committee once again for coming here and doing a marvelous job at today's hearing.

Mr. LEVITAS. Thank you, Bill. Before I ask you one or two concluding questions, let me add my word to you that you heed Chairman Lehman's advice. I listened to it very carefully, and he really said a mouthful. With the agenda that UMTA has before it, with the growing responsibilities, both in terms of number of properties and number of dollars involved, there is no reason why the advice that has been passed on today should not be heeded.

In 1982 a subcommittee staff memo that was provided to the subcommittee, which was based on some interviews, talked about the very point that Congressman Lehman is worried about. Our investigative staff interviewed a very, wise and prescient Urban Mass Transit Administration official on the situation here, who made the observation that if the Department of Defense had a project of this size, they would have 50 people in Miami trying to oversee the expenditure of funds and the development of the project.

That is not the way UMTA is set up, and nobody is proposing that it be restructured in that fashion. But UMTA is the agency to whom we in the Congress look for the stewardship of these billions of dollars, and therefore I would suggest that some very serious attention be paid to Congressman Lehman's suggestion.

Let me ask you this question. You, as I understand it, are proposing that the transit system operate or be required on major projects to contract with consultants to perform construction management oversight.

Mr. STANLEY. Yes, sir.

Mr. LEVITAS. Would there need to be any changes in the law to permit this to occur?

Mr. STANLEY. Not to my knowledge. I think that would be something that could be incorporated in the full funding contract. The one issue that would require a statutory change is the degree to which that is paid for by the Federal Government. As it is now, we have the matching requirement in the statute. If that were to be specifically changed to ensure——

Mr. LEVITAS. I think we will probably address that in terms of legislation and recommendations, and you might want to submit to us your thoughts on the matter.

[The following was submitted for the record by Mr. Stanley:]

PROVIDED FOR THE RECORD BY MR. STANLEY

It is our view that a workable mechanism exists within the current statutory framework, using existing capital resources, to provide for construction management oversight. As I stated in my testimony, UMTA intends to require grantees to use independent consultants for construction management oversight by including this requirement as a provision in full funding contracts or other contractual documents between UMTA and its grantees. Such a provision would establish a direct

reporting relationship between the consultants and UMTA. We believe it is important to make this process a standard part of major capital projects, so that having consultants perform construction management oversight becomes the normal operating procedure for these types of investments.

Having a direct reporting relationship between the consultants and UMTA would ensure the credibility of the relationship. It is true that the consultants would be paid out of funds awarded to the grantee. However, 75–80% of the cost would be paid by the Federal Government. Therefore, to extent that financing is a major consideration in determining accountability, it should help ensure that the consultants will be accountable to UMTA.

The possibility has been raised of amending the Urban Mass Transportation Act to establish a program of 100% Federal financing for construction management oversight. Our preference would be to follow the approach that we have recommended and defer legislative action on this point. If problems develop in accountability or other areas as this approach is implemented, we could then revisit the issue.

Mr. LEVITAS. I don't want to speak on behalf of the subcommittee or to get ahead of ourselves, but I think it is pretty clear that we will make recommendations for legislative changes to require something of this sort. But in your testimony earlier, when you began to assess the alternatives, you said, and I think quite correctly, that one of the disadvantages to that is the fact that since the consultant would be paid by the grantee, you say, "One potential problem would be that of accountability in that the consultant would be paid directly by the grantee." I think Mr. Nowak in his questions earlier today pointed out that one of the reasons this Morrison-Knudsen operation has some credibility is they are not being paid by Metro-Dade. While you say that you could build contractual protections in there, based on my limited experience with the public, there is belief in the old expression that he who pays the piper calls the tune, and you can protest all day long that that is not true.

You can get 50 bishops and 50 rabbis and 50 pastors to swear to the honesty of these people, and that citizen out there is going to say he who pays the piper calls the tune. So if you are looking for credibility, I think you need to be looking for some other means than that contractual relationship.

I am not suggesting there shouldn't be some formula contribution, but I think it has got to be, as Mr. Nowak said, some independently, perceived organization. Would you comment on that?

Mr. STANLEY. I share that concern, and part of what we initially discussed is 100 percent Federal financing. I think there are adequate capital resources that UMTA provides grantees. Our concern was whether we should segregate out a specific account that would be construction management oversight, I think the TSC report indicated that if you were looking ahead for 5 to 7 years, assuming $5 billion a year in on-going capital assistance—that the amount that would be required to conduct construction management oversight would be approximately one half to 1 percent, which would be about $25 million. That seems a small amount out of our total capital assistance program to provide that kind of a service.

Mr. LEVITAS. I think it is a critical point, and one that we need to focus on.

Let me ask you this. Do you see any importance or significance attached to the State role in oversight, based upon the different systems you have looked at? Mr. O'Connor or Mr. Carroll.

Mr. CARROLL. I am not sure I understand the question.

Mr. LEVITAS. In some places, like Maryland for example, the system is being built by the State, as I understand it, by a State authority. In Georgia you have got the State Department of Transportation actively involved in the rapid transit administration, and you have got a legislative oversight committee that specifically monitors the activities of the rapid transit program. In Miami, Metro-Dade, you don't have that situation.

Mr. CARROLL. They have State overview personnel out of Tallahassee based here. They look at how the project is proceeding and protect their 10 percent share of the project. They are very capable people, but a transit system is a highly local matter, as you well know from Atlanta, and you don't make State decisions, just like you don't make Federal decisions, on something that is a very local matter.

Mr. LEVITAS. Let me tell you one of the problems. I remember an old story that I used to hear about a town, a coal mining town, and they blew the whistle every day 8 o'clock in the morning and the people went to work, and at 12 o'clock every day for lunch, and then at 4 o'clock in the afternoon and people went home. Thet blew it absolutely right on the button.

One day the manager of the mine was walking by the jeweler's shop on Main Street, and he dropped in, and he said, "You know, I have never told you this," he said, "but the reason we are so punctual is that every day when I walk to work, I stop by and look at the clock in your window, and I set my watch by it, and that is how we know it is the right time." And the jeweler said, "That is interesting. The reason I know at what time to set my watch and clock is when your whistle goes off."

We have heard from our investigative staff, when they have done work here and in Tallahassee, that the State of Florida—and I am quoting—"relies on Federal project oversight because its Department of Transportation does not have the personnel to monitor and analyze projects." Would you comment on that?

Mr. CARROLL. It looks like it is kind of given to the locals by default.

Mr. LEVITAS. That is what concerns us, I think, and that is what we are talking about. It is not a question of lack of confidence. It is a question of saying that if we are paying out $685 million of Federal taxpayers' money, we feel there needs to be some Federal involvement, and not, as I suggested earlier, as someone else said, that we are just shoveling out money.

Let me ask you this question. Early in your testimony, Mr. Stanley—I want to clarify this—you talk about quality control, responsibility for quality control, and you say, "The only exception to this," this being quality control being performed by KTG, and then DCTA, but you say, "The only exception to this was that the girder manufacturer, R.T. Joint Venture, was contracted to perform quality control on the precast girders with KTG providing continuous quality insurance inspection."

Now as I recall having asked the question about that earlier in the day of the Metro-Dade witnesses, they told me that there was an independent firm doing the quality control on the girders rather than the manufacturer. What is the situation on this?

Mr. CARROLL. I think the point we are trying to get across there is that in the case of the girder manufacturer, there was a requirement that the contractor perform his own quality control hands-on inspection, measurement, and so fourth, whereas in the balance of the construction contracts that was not the case. Dade County was expected to perform the quality control hands-on inspection process from the beginning.

Mr. LEVITAS. Yes.

Mr. CARROLL. And the quality assurance in the case of the girder fabrication did fall to Dade County, and of course both quality control and quality assurance fell to Dade County in the rest of the construction.

Mr. LEVITAS. The reason I asked the question now, I am just trying to clarify it, because my recollection is very clear, that when I asked that question today, I was told by Mr. Higgins, I believe Mr. Higgins told me, that Raths——

Mr. CARROLL. Raths, Raths & Johnson.

Mr. LEVITAS [continuing]. Were doing the quality control, and I just want to find out which is correct.

Mr. CARROLL. Raths, Raths & Johnson is a consultant brought in for doing highly exotic testing on the girders and pier caps. They do not have direct quality control on construction per se, other than they report to the county who then implements.

Mr. LEVITAS. If anybody wants to submit anything in writing on that point.

Mr. STANLEY. I think that was an attempt to try and describe the history. The Raths, Raths & Johnson testing was done subsequent to that.

Mr. LEVITAS. Let me ask another question. Has UMTA made an estimate of the additional cost that Metro-Dade would have encountered if it had been unable to make this sort of urban acquisition from the Florida East Coast Railroad, of that linear strip from——

Mr. CARROLL. No, sir. We have not.

Mr. LEVITAS. Would you think it would be significant. It seems like a wonderful opportunity.

Mr. CARROLL. Off the top of my head, it looks pretty good, but the OIG disagrees with us because they think we paid too much by buying it all at one time. It is a matter of opinion.

Mr. LEVITAS. How much was the price paid?

Mr. CARROLL. About $22.5 million, as I recall.

Mr. LEVITAS. And that is about what, 8 or 10 miles?

Mr. CARROLL. Yes, sir.

Mrs. OESTERLE. Twenty-six million dollars.

Mr. LEVITAS. That is about.

Mrs. OESTERLE. Twelve miles.

Mr. LEVITAS. It sounds like a pretty good way to me.

Mr. CARROLL. The real estate for the whole system is over $100 million, so it appears on quick analysis, if they had got all of the right-of-way, it would have been much better off.

Mr. LEVITAS. I don't know much about that, but if you had to come down through the middle of Atlanta right now and buy that length of real estate, it would cost you a heck of a lot more than $26 million. I believe I have no further questions at this point.

Mr. Molinari.

Mr. MOLINARI. One of the unanswered questions here, and I don't know whether you gentlemen can answer it because I suppose there is a degree of sensitivity here since the Inspector General's investigation is still ongoing, concerns the Inspector General's role. On page 3 of your prepared statement, Mr. Stanley, you mentioned that by some type of communication on March 15, 1983, the Inspector General of the Department of Transportation advised the then UMTA administrator that there were potential construction problems. And then thereafter your testimony said, "UMTA decided to investigate."

I am just wondering if you can share with us, without interfering with whatever investigation might be going on at the present time, what was the nature of that communication that led to a great confrontation here? I can't help but wonder what substance there might have been to that original communication from the Inspector General that caused this investigation. Mr. McManus.

Mr. MCMANUS. They transmitted the FHWA report that said that there was a likelihood that the Dade County Metrorail was not being built to specifications, and it was on the basis of that statement that the administrator decided to look further.

Mr. STANLEY. I was just going to add that the highway engineer's report was part of the overall IG's investigation. I think they indicated to UMTA beyond the scope of the investigation that they had raised some concerns about construction deficiencies, and that is why UMTA decided independently to contract with TSC, and the IG continued their investigation unrelated to that.

Mr. MOLINARI. Do you have any idea when the IG might complete that investigation?

Mr. STANLEY. The last I was notified, that would be completed within 60 days.

Mr. MOLINARI. Sixty days from now?

Mr. STANLEY. Sixty days they would complete their investigation.

Mr. MOLINARI. You compared, toward the end of your testimony, different projects, and you talked about consultants that were brought in. My question is: Are the consulting firms that you referred to in your description of other grantees and other construction management activities in any way related to project engineering and design, or are they construction management experts who have no part in the project design?

Mr. STANLEY. My understanding is there is an independent construction management consultant. Each of those projects I mentioned also has, although described as a consultant, significant other architectural and engineering firms involved in the design of the project, but each has in place the construction management plan or process carried out independently.

Mr. LEHMAN. Mr. Chairman, may I just say one thing?

Mr. LEVITAS. Yes, Congressman Lehman.

Mr. LEHMAN. I think that this country has so much of its future riding on urban mass transit that we cannot afford to take any unnecessary chances on the kind of systems that you are going to be in charge of building. Thank you again for coming down here. I have some additional questions to give you, and I request that you respond to them for the record.

[Questions posed by Mr. Lehman and responses received from Mr. Stanley follow:]

Question 1. On page 12 of your testimony, you said UMTA reviews Tri-Met's (Portland) quality control efforts (as opposed to budget or minority business) on a quarterly basis. Why is the quality control effort in your Region 10 office apparently different than in your other regional offices?

Response. UMTA's Region 10 office, at their own initiative and as a result of hearing of potential construction quality problems in Miami, has paid increased attention at recent quarterly progress management meetings to reviewing the quality assurance function for the Tri-Met project. Although not mentioned in my testimony, the other regional offices are now paying increased attention to quality issues in their quarterly reviews of major projects. The Region 10 engineer was able to get into the issue earlier due to his relatively lighter major project workload at the time.

Question 2. In your statement (page 13) you indicated that you believe we should consider dealing with this issue by requiring that grantees contract with consultants to perform construction management oversight. Under this concept, would the contractor report directly to UMTA or to some local authority?

Response. Under our concept of increasing UMTA's oversight of major construction projects, we are considering requiring that the grantee contract with an independent consultant who would report directly to UMTA. UMTA would in turn review the consultant's report and then work with the grantee to improve any areas found deficient.

Question 3. Some people have problems with UMTA hiring an independent consultant for quality assurance because they feel a private firm overseeing another private firm that is a competitor might cause some difficult relationships. Do you see any problems with such an approach?

Response. We do not see problems with the concept of hiring an independent consultant to provide oversight of the activities of the grantees' construction management staff or consultants. This procedure is not very different from a consulting engineering firm or construction management contractor overseeing the work of a construction contractor, which is common industry practice.

Question 4. On page 7 of your testimony, you say that Federal Highway Administration [FHWA] engineers are not experienced in all facets of transit construction such as signalling, power distribution, and the like. I understand the Federal Railroad Administration [FRA] has contracted with the FHWA to provide engineering support and project oversight on the $2.2 billion Northeast Corridor Program [NCP]. That project has all of the elements you mentioned. Why is the FHWA engineering capability apparently good enough for the FRA but not for UMTA?

Response. We do not question FHWA's engineering capabilities but we would not use these capabilities for UMTA projects in the same way that FRA has used them in the NCP project. The FRA primarily uses the civil engineering expertise of the FHWA engineers assigned to the NCP project rather than their limited signalling, communications, and power distribution capability. The FRA's own engineers, together with private consultants, perform the major overview of electrical and electronic systems and subsystems. Any specialized capability that FHWA has acquired in the area of signalling, communications, or power distribution was gained through onsite experience on that project and is limited to the 21 FHWA staff personnel, under direct FRA supervisory control, assigned to the FRA NCP project. Notwithstanding the civil engineering expertise provided by FHWA, FRA has found it necessary to use private engineering firms to design, manage, and oversee the project. FRA uses the FHWA staff as Headquarters monitors. The FHWA engineers (with the exception of 5 engineers in Philadephia) working on NCP project oversight are centrally located in Washington.

The FRA NCP situation differs significantly from that of UMTA. The NCP project has a limited size and scope, is located along one railroad corridor, and is centrally managed. UMTA projects vary in size and scope, are all scattered throughout the U.S., and are managed by numerous transit agencies. FRA construction management oversight is centrally managed. UMTA construction management oversight would occur largely in the field. FHWA engineers are assigned on a full-time basis to FRA. Use of FHWA district or regional engineers would not mean full-time UMTA assignment. They would be only part-time employees devoting time on FHWA and UMTA activities, and thus UMTA would not have direct control over these employees. Contrary to the FRA experience, all FHWA employees assigned to UMTA would have to undergo a sizable and costly training program, since UMTA would be using these employees for electrical and electronic, as well as civil, sys-

tems oversight. Finally, a significantly higher number of FHWA engineers than that assigned to FRA would have to be assigned to UMTA projects to assure the same level of management oversight that FRA administers over the NCP project, a level which may exceed the FHWA resources available.

UMTA does recognize, and has used the civil engineering expertise of the FHWA. It will request FHWA expertise in the future if necessary and appropriate.

Question 5. You indicated that you provide capital assistance to the most cost effective systems. If you have no, or only limited, capability to review the design of a proposed transit system, how can you determine which systems are the most cost effective and which of the alternative designs for one particular system is the most cost effective?

Response. In selecting projects for capital assistance on the basis of cost effectiveness, the measures we are currently considering using are added cost per added rider over a base system, and time savings for existing riders. We do not use design factors in the selection process per se. However, we do encourage and provide for the review of design issues by peers and are requiring value engineering reviews at the preliminary design stage of major new construction projects.

Mr. STANLEY. I want to thank Congressman Lehman who has been tremendously helpful to me in arranging meetings with the Dade County officials, and that advice he gave earlier is something I take very, very seriously.

Mr. LEVITAS. Dr. Rowland.

Dr. ROWLAND. No further questions.

Mr. LEVITAS. Mr. Nowak.

Mr. NOWAK. No questions.

Mr. LEVITAS. I have no further questions, Mr. Stanley, of you and your colleagues. I want to thank you for very excellent testimony.

You ought not to wait until you get to Miami in order to meet with your oversight committee, however. It makes things a lot easier. We work better together when we have a better understanding of our mutual interests and concerns, but I do want to commend you on your testimony, and believe that there have been some important observations made today as well as insights gained which we did not previously have. Again I want to thank you for your participation. You are excused.

Mr. STANLEY. Thank you very much, Mr. Chairman.

Mrs. OESTERLE. Mr. Chairman, on behalf of Mayor Steve Clark and my fellow commissioners, I want to personally thank your committee, Mr. Ralph Stanley and his group for being here, and especially Mr. Bill Lehman for bringing us all together. I think it has been a very productive hearing.

Mr. LEVITAS. We have one more witness. I don't think it is going to be long.

Mrs. OESTERLE. That is OK. I have said it. I won't say it again.

Mr. LEVITAS. Thank you very much. As I expressed to you, if you are not here at the end, I was going to express my appreciation to you and the Metro-Dade government for your help.

Our final witness today is Mr. Kent Larsen with the Morrison-Knudsen Construction Co., with respect to whom we have had some testimony.

Mr. Larsen, if you would come forward to the witness table. Would you raise your right hand.

[The witness was sworn.]

Mr. LEVITAS. Thank you very much, Mr. Larsen. As I am sure you have heard during the last number of hours, there have been references made from time to time to the role that your firm is playing in this matter, and I would like to ask you to present your

statement as you so desire, but identifying at the outset your position, a little bit of your personal background, and some information about the firm Morrison-Knudsen.

TESTIMONY OF W. KENT LARSEN, MORRISON-KNUDSEN CONSTRUCTION CO., INC.

Mr. LARSEN. Mr. Chairman, that is all in my presentation, but in the interests of moving on, if you like, we can skip the reading of it.

Mr. LEVITAS. Yes. I would say your entire statement, without objection, will be made part of the record in its entirety. You may proceed as you wish.

Mr. LEVITAS. The reason I asked you those questions up front is I haven't read your statement yet, and I would like to know a little bit more about you and your company.

Mr. LARSEN. My title is project director, Morrison-Knudsen, for the UMTA project. We are consultants to UMTA. I personally am a civil engineer, and registered professional engineer in six States.

In addition to that, I am a licensed general contractor in the State of Florida. I have been in construction approaching 25 or 26 years at this period of time, have served on both sides of the construction table in that I was with Armco Steel for 15 years, and was the senior engineer of construction during their major expansion in the late sixties. We spent approximately $800 million in modernization and expansion. That was done under CM contracts, and they reported through my office.

Since being with Morrison-Knudsen, I have performed both internationally and domestically as far as the projects I have been on. I have nuclear experience and more recently transportation. My most recent project was at the Epcot Center at Walt Disney World, where we built the monorail. We completed that project 4 months ahead of schedule. In addition to that, two other major contracts had project managers who reported through me. We had approximately $90 million of firm price work during that time, and every one of those contracts came in ahead of schedule.

In the Engineering News Record—and I would have to look at my statement to get the exact date—but anyway, in one of the record Engineering News issues, Morrison-Knudsen is listed as the No. 1 heavy contractor in the world. That is worldwide. We own a subsidiary, International Engineering Co., which is ranked by the Engineering News Record as No. 2 in international design worldwide. So as you can see, we are uniquely qualified to participate as a consultant for this project.

One of the things that I want to point out is that we did not actively seek this position. UMTA came to us. We agreed to act as consultants after some discussion. One of the things that we agreed to was that there would be complete and open communications between us, MDTA, and UMTA.

Is there anything further you would like to have me elaborate on before you get to the questions and answers?

Mr. LEVITAS. No, that is fine. Would you tell us briefly how you view the role of Morrison-Knudsen under this contract? What do you see your role as being?

Mr. LARSEN. Well, under the letter contract, we had eight specific tasks listed. But to summarize those, we are down here to monitor, to review, and to report.

Mr. LEVITAS. We have heard that one of the things you are doing is monitoring the test loading and the testing of the hammerhead pier caps.

Would you tell us precisely what you are doing in that regard? How are you going about that?

Mr. LARSEN. Yes. Raths, Raths & Johnson, who is the firm that MDTA has hired to do the load testing, is a very competent and highly respected engineering firm. We deal closely with their personnel. Mr. Chuck Guedelhoefer is the person heading that up. We participated in reviewing the test procedures. By that, I mean how do you test a pier and how do you evaluate the results.

In reviewing those procedures, we reported to RR&J that the methods proposed would show up in our report to UMTA as being acceptable. During the testing itself we had both a quality assurance man and a structural engineer observing the testing and have found no faults with the methods used. The preliminary findings we agree with, which are essentially the fact that the piers tested meet required design criteria.

Mr. LEVITAS. Are the performance requirements, the design criteria, based upon static or dynamic testing?

Mr. LARSEN. It is a combination—it is based upon static and dynamic requirements for design. But the load test itself is static.

Mr. LEVITAS. Is that adequate?

Mr. LARSEN. Yes.

Mr. LEVITAS. If there is a dynamic criterion for the loading of that pier, how can you test it through static loadings?

Mr. LARSEN. I can give you a better answer with my structural engineers. We have not gone into that in depth, but basically the loading that is being specified for the testing includes some group loadings which basically include a full-speed, high-speed derailment load. That is a significant factor and is figured in the total load that is applied to the pier.

Now, the dynamic loads that would be imposed would be actually what amount to operating loads, and those are significantly less than the load that was tested—again, the full high-speed derailment load.

Mr. LEVITAS. Is the action of the force in dynamic testing or your dynamic loading a train running over the tops of the tracks on top of those piers? Does it have any different characteristics from an even greater load, but in a static mode?

Mr. LARSEN. It is hard to answer that in nontechnical terms. But basically it is a lighter load occurring frequently. There are such things as fatigue, which occur in both steel and concrete, but the design in structures in the past has been basically that the fatigue factor is covered in the design criteria when it is set forth.

Mr. LEVITAS. Let me just ask you two last questions. The first is, you have heard some discussion today about a disagreement between professionals as to whether or not the design firm should also have responsibility for construction management. Metro-Dade officials come out on the side that they shouldn't.

The recent conference in Santa Barbara, which I made reference to, and some other sources, believe that that is the only way you can get accountability built into the system. What is your view of the matter, Mr. Larsen?

Mr. LARSEN. First, I would like to point out to you that I am both an engineer and a construction man, and I take great pride in being an engineer; and, as a matter of fact, when I am asked, I list my profession as an engineer rather than manager.

I haven't seen that particular report yet——

Mr. LEVITAS. Are you familiar with that meeting?

Mr. LARSEN. No, I did not attend. As you may be aware, we were going pretty hot and heavy down here at that time getting our feet on the ground. So, no, I was not at that conference.

I may have some colleagues at the company who may have attended. I am just not aware of it.

But, back to your question. If you will look toward the end of my report, I make the statement that I do not believe that you can be a construction manager unless you have done construction. Unfortunately, there are a lot of engineering firms doing CM, construction management, and program management—and there is a slight difference—today, that are not qualified to do it, simply because they don't have the hands-on experience that I feel is necessary to do a good job of construction management.

Let me also qualify that by saying there are some engineering firms that are capable construction managers.

To respond to your question as best I can, I feel that you should have construction experience to become a construction manager. I do not feel that being an engineer or a design firm qualifies you as a construction manager. Purely on that evaluation, I would disagree with what was printed in the Engineering News report.

Mr. LEVITAS. This hammerhead pier design that we have been talking about, which appears to have had more complexity in it than may have been necessary, first of all, do you have any opinion on that; and, second, if you do agree that that is the case, is there some point along the line where that might have been picked up earlier than it was, and by whom?

Mr. LARSEN. I am going to have to disagree slightly with some of the previous testimony. It becomes purely technical.

Basically, that pier was not overdesigned. Basically, in the design used, there is nothing new there. It is a combination of reinforcing in concrete that has been done for hundreds of years. If you take a hundred structural engineers and you give them the problem to design a pier with a hammerhead on it, and make it work, you will probably get 99 different designs. Of that 99 different designs, if they are all competent engineers, all 99 designs will work.

There may be a most economical design. The hammerhead pier, as you have been discussing, as a matter of fact we built several hundred of them in Disney World. We did not use reinforced concrete. We used a structural steel plate. No problems. The reinforcing is designed—and I will not pass on that particular method of design, that particular combination of reinforcing in concrete—but in my opinion, it could have been done with reinforcing in concrete in a different manner and be adequate to carry the loads.

Does that answer your question?

Mr. LEVITAS. That answers the first part of it.

The second part is, if that is the case, who and at what point could that have been picked up? Somebody suggested—Mr. Higgins, I believe, and it sounded plausible to me—that the construction firms that were bidding on the contract with their own engineering capability might have looked at that and said, "Hey, you can do this a lot simpler than you are asking us to do it."

Mr. LARSEN. First, may I explain to you briefly the bidding process for a construction firm?

Being a construction firm, we bid several hundred jobs a year. We have neither the time nor the resources to investigate each project that we bid as to, No. 1, the constructability, or No. 2, the design completeness of those projects. We assume that when we are given drawings, that those drawings are adequate, complete, and can be built as given to us.

So there was no requirement, nor would there be any inclination on the part of most construction companies to look at that in depth.

At what point should it have been picked up? We were not tasked in coming down here by UMTA to review past management activities, if you will. As such, we have not done that. So I can only give you an opinion.

At some point in time I am sure it came to someone's attention that the constructability, if you will, the ability to build what was designed, was questionable on that pier. When that first occurred was when the question should have been asked: "Should we change it?"

Mr. LEVITAS. Thank you.

Mr. Molinari.

Mr. MOLINARI. Just let me review to make sure I understand, Mr. Larsen.

Is it your testimony that the hammerhead caps or pier caps are not overdesigned?

Mr. LARSEN. No, sir, they are not overdesigned. The statement overdesigned I think was meant to say that they are extremely complicated in design. The criteria in the design itself, the methods of placing the reinforcing bar, the size of the reinforcing bar, is not unique to that structure.

I was trying to remember if I have seen any hammerhead piers on highway bridges in this local area. I can't think of a specific case. They are maybe not common, but they are not unique throughout the Nation.

I would suspect that if you would do a study, you would find several of them in existence.

Mr. MOLINARI. This question of complexity, we saw the pictures.

Mr. LARSEN. Yes, sir.

Mr. MOLINARI. It looked like a lot of spaghetti to us, perhaps.

But from a construction standpoint, does that pose any great problem to those who are involved in putting it together?

Mr. LARSEN. The constructability of that—and bear in mind, again, I was not tasked with reviewing constructability per se—but the constructability of that certainly could have been enhanced through design changes if it was so desired.

Mr. MOLINARI. In what manner?

Mr. LARSEN. The easiest thing to do—and I am going to talk generic instead of specifics, because it would take a structural investigation to respond to you completely—but basically you could increase the area of the rebar, increase the size of it. I don't know if you are familiar with how rebars are sized, but it is by eighths of an inch. A No. 4 rebar is a half-inch rebar. A No. 8 is a one-inch rebar. As you increase the diameter of a circle, the area increases at a greater proportional rate.

Basically, when you design concrete and reinforcing, you are designing by the amount of area of reinforcing and how it was embraced in that concrete. So one of the methods that certainly could have been looked at was to increase the area of the bar while decreasing the count of the bars.

We have heard testimony about diagonal placement of the bars. Those were the bars that went—if you will envision an inverted "T"—that went across the bottom of the "T" and up into the arm. That is a good way to transmit loads.

As it happened, the misplacement of those bars in some instances contributed to the ability of that hammerhead pier to perform better than intended. It sounds funny, but, as a matter of fact, there is no question about, in most cases, the ability of the hammerhead pier to carry a load out, if you will, on the extended arm.

The question is: Can it carry the loads on the ledge? That is the little piece that sticks out. To carry that load, you have to transmit forces, if you will, which is simply the weight of the girder and the live loads into what is now the vertical portion of the "T."

There are a great many ways you can do that. And, as a matter of fact, there was at least two different methods used here. One was the use of normal reinforcing steel. And the other way was to use plate structures that were welded up and inserted into the hammerhead.

In some instances where the diagonal steel was misplaced more vertically, it helped transmit that ledge load. So, yes, there were other ways to do it that would have been very acceptable, I think, to everyone, perhaps even the designer that designed them.

Mr. MOLINARI. The important thing is that it works. It is going to bear the load that it is intended to carry and then some, so therefore it is safe.

Mr. LARSEN. Can I qualify that?

Mr. MOLINARI. I wish you would.

Mr. LARSEN. The load tests we have conducted to date—excuse me, that we have observed to date—that Raths, Raths & Johnson have conducted, have performed exactly as predicted, and by that I mean they failed in the manner that was expected. They failed at loads greater than the design criteria. That data gives us, if you will, a data base from which we can evaluate empirically how the remaining pier caps will perform. There are in all probability two more load tests required.

I am not prepared to say how those two tests are going to come out, but the data we will derive from those tests will then allow us to make calculations and determinations as to the acceptability of the system as presently constructed.

Mr. MOLINARI. If I understand you correctly, what you are saying is that the jury is still out on the question.

Mr. LARSEN. It is still out, but we have had awful good results to date. I would like to make this statement, that when I first came down here, my very first meeting with Merrett Stierheim, Clara Oesterle, Gene Carroll, and Jim O'Connor, the latter two of Region IV, Atlanta, as you can imagine, everyone wanted a quick answer before knowing anything about the problem.

Mr. MOLINARI. I thought it was only us.

Mr. LARSEN. I made the statement to that group that there is nothing out there that cannot be fixed. There has been nothing that has happened in the last 2 months that changes that early evaluation. There are some things out there that need to be fixed. As long as we identify those, and if you will excuse me, when you get involved in a construction project like this, it becomes "we," whether that is really my task or not, but the main problem is to identify the things that need to be fixed.

Mr. MOLINARI. How long is that process going to take?

Mr. LARSEN. In reality, based on what we see out there today, because of the after-the-fact, if you will, identification in some instances, that is probably going to take a little longer than normal. I don't mean to be evasive, but to be completely sure, I would say that it is going to be to the end of construction, a year from now. Probably the major problems can be identified within the next 6 months.

Mr. MOLINARI. Is there a possibility that as a result of your inquiry, some of the remaining construction will be slowed down because of deficiencies that you might encounter?

Mr. LARSEN. If you are speaking as to UMTA's contribution or as to in general the question——

Mr. MOLINARI. In general.

Mr. LARSEN. There was a hold on construction when we first came down here, because of some questions that had arisen. Merrett Stierheim, through his staff, made the decision to release the hold on construction. There has been a delay. I would suspect that we will not see any further delay from that type of thing, but that we may possibly, and I have to qualify that by saying possibly, have potential for delays if there are some areas that have to be fixed.

Not that I think those need be major delays, but depending upon what we find in the load test, those types of things, I have just got to say there is a possibility but not a high probability.

Mr. MOLINARI. And you mentioned, I believe, that there are eight specific areas that you are covering in your study.

Mr. LARSEN. Yes. That we have been tasked with.

Mr. MOLINARI. Is that in your task?

Mr. LARSEN. Yes, it is. Each one of them is identified.

Mr. MOLINARI. You will have to forgive me. I read this at 1:30 this morning or thereabouts.

Mr. LARSEN. I can appreciate your problem.

Mr. MOLINARI. I would like to make a request that you provide the subcommittee with a copy of the contractual agreement that you have entered into with UMTA.

Mr. LARSEN. I have no problems with that, but may I check with UMTA to see if that is acceptable?

Mr. STANLEY. That is fine.

Mr. LARSEN. You would like a copy of the letters contracts and the scope of the work, is that correct?

Mr. MOLINARI. Correct.

[The following was provided for the record:]

MORRISON-KNUDSEN CO., INC.,
Miami, Fla., December 15, 1983.

COMMITTEE ON PUBLIC WORKS,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
Rayburn House Office Building,
Washington, D.C.

Attn.: Mr. Charles A. Krouse, professional staff member.

DEAR MR. KROUSE: In response to the request of the Subcommittee Chairman at the Congressional Hearing held in Miami, Florida on December 13, 1983 I am enclosing a copy of the Letter Contract and Statement of Work for our contract with UMTA on the Dade County Metrorail.

If our office can be of any further assistance please do not hesitate to contact us.

Very truly yours,

W. KENT LARSEN, *Project Director.*

Enclosure.

U.S. DEPARTMENT OF TRANSPORTATION,
URBAN MASS TRANSPORTATION ADMINISTRATION,
Washington, D.C., October 7, 1983.

Subject: Letter contract DTUM60-84-C-71239.
Appropriation data: ID-06-0001, EP4, $190,000.

MORRISON-KNUDSEN CO., INC.,
Morrison-Knudsen Plaza,
Boise, Idaho.

GENTLEMEN: Your acceptance of the terms and conditions set forth herein constitutes a contract and signifies the intention of the parties to promptly enter into good faith negotiations to definitize and execute a contract for the support services needed for Structural Analyses and On-site Monitoring of the MDTA Metrorail Construction and Repair. This work will be performed in accordance with Attachment "A"—Statement of Work.

(2) As a priority work item the contractor shall submit to UMTA for approval the planned work tasks and staffing levels (Draft Project Implementation Plan), to accomplish this immediate action $190,000 effort. The planned work tasks and staffing levels shall include the following:

(a) Detailed description of each work task, proposed approach, sources of data collection and interviews to be conducted;

(b) identification of personnel assigned to the project and man-hours budgeted for each work task;

(c) planned schedule milestones for each work task.

(3) A letter contract consists of this letter, the Statement of Work, and General Provisions, Attachment "B". The effective date of award shall be October 10, 1983, as signified by your signing the acceptance block at the end of this letter. The definitized contract will bear

(4) the effective date of this letter contract.

You shall proceed immediately upon acceptance of this letter contract with the performance of the contract work in accordance with the terms and conditions stated herein.

(5) Upon completion of negotiations, you will be required to submit a Certificate of Current Cost or Pricing Data pursuant to FPR 13.807-4. The penalty for making false statements is prescribed in 18 U.S.C. 1001.

(6) This letter contract is entered into pursuant to the authority of 41 U.S.C. 252(c)(10) and P.L. 88-365, as amended.

(7) *Limitation of Government's Liability.*—The contractor is not authorized to make expenditures or to incur obligation in preformance of this letter contract, the total of which would exceed $190,000, which is the maximum liability to the Government.

(8) Payment of Allowable Cost Prior to Definitization of the Contract:

(a) For the purpose of determination the amounts payable to the contractor hereunder, allowable items of cost shall be determined in accordance with the provisions of this letter contract and the cost principles set forth in Subpart 1-15.2 of the FPR.

(b) The contractor is responsible for the submission of monthly vouchers and suporting documentation for all costs claimed in performance of this contract. Each voucher shall be prepared in accordance with Attachment C—"Instructions for Preparation of Public Vouchers and Reimbursement of Costs Under Cost Reimbursement Type Contracts," and shall be numbered serially starting with No. 1 for the first voucher.

(c) All vouchers, except for the final voucher, shall be submitted to the UMTA Accounting Office at the address shown below. Submission of vouchers will be monthly. Use Project No. ID-06-0001 on all vouchers and correspondence relating to vouchers: U.S. Department of Transportation/UMTA, Office of Accounting, UFM-20, 400 Seventh St., SW., Room 9424, Washington, D.C. 20590.

(d) At any time or times prior to final payment under this contract, the Contracting Office may have the invoices audited. Subsequent payments shall be subject to adjustment for amounts found by the Contracting Officer, on the basis of such audit, not to constitute allowable costs. Any payment may be reduced for overpayment or increased for underpayment on preceding invoices.

(9) Definition:

(a) A cost reimbursement type of contract is contemplated. The contractor agrees to enter into negotiations promptly with the Contracting Officer to reach agreement on a definitized contract, which will include the clauses and terms and conditions of this letter contract as they may be changed by negotiations.

(b) This letter contract shall be superceded by a definitive contract within 120 calendar days from the acceptance of this letter contract.

(c) If agreement on a definitive contract to supercede this letter contract is not reached by the target date set forth in b. above or any extension thereof by the Contracting Officer, the Contracting Officer may determine a reasonable price in accordance with FPR, Subpart 1-3.8 and Part 1-15, subject to appeal by the contractor as provided in the "Disputes" clause of the contract. In any event, the contractor shall proceed with completion of the contract, subject only to the "Limitation of Government Liability" clause. After the date of the Contracting Officer's determination of price, the contract shall be governed by:

(i) the contract General Provisions and such other requirements as are contained in the subject contract;

(ii) All clauses required by the Federal Procurement Regulations on the date of execution of this letter contract for a cost-reimbursement type contract as determined by the Contracting Officer under this paragraph c.;

(iii) All clauses required by law as of the date of the Contracting Officer's determination; and

(iv) Such other clauses, terms and conditions as may be mutually agreed upon. To the extent consistent with the foregoing, all clauses, terms, and conditions included in this letter contract, except by which their nature are applicable only to letter contracts, shall continue to be effective in the definitive contract to the extent not changed by negotiation and/or definitization of the letter contract.

(10) Special Provisions:

(a) During the performance of this contract, the contractor agrees not to bid or propose to furnish services or enter into any contractual arrangement with the Metro-Dade County Transportation Administration.

(b) It is expressly understood that the nature of the work called for under this contract is subject to change and redirection and that the contractor will make a reasonable effort to control or terminate costs as directed by UMTA. In addition, advance commitments, which could be expensive in the event of a termination, will be kept to a minimum.

(c) The contractor will keep in mind that its efforts under this contract are being procured with the purpose of providing advice and recommendations to the Government in order that the Government may subsequently formulate decision and that any technical data supplies should be presented in connection with such advice and recommendations and that the predecision nature of this effort and all reporting will intertwine any recomendation to the Government with the technical data supplied.

11. If the proposed agreement meets with your approval, please sign and return three (3) copies of this letter to the following address: Mr. Thomas S. Wilson, Department of Transportation/UMTA, Contracts Division, UAD-41, 400 Seventh St. SW., Room 7101, Washington, D.C. 20590.

Your acknowledgement and acceptance of these terms and conditions shall be made on the spaces provided below. If there are any questions, please contact Mr. Wilson on 202-755-4980.

Sincerely,

THOMAS S. WILSON, *Contracting Officer.*

Enclosures.

[Attachment A]

STRUCTURAL ANALYSIS AND ON-SITE MONITORING, METRO-DADE COUNTY TRANSPORTATION ADMINISTRATION [MDTA] METRORAIL CONSTRUCTION AND REPAIRS

BACKGROUND

From March to June, 1983, a Department of Transportation [DOT] Task Force conducted a technical assessment of the quality of construction on the partially completed Metrorail rapid transit system in Miami, Florida. This technical assessment was conducted for the Urban Mass Transportation Administration. The impetus for the technical assessment was a report dated February 9, 1983, prepared by engineers from the Florida Division of the Federal Highway Administration [FHWA] for the Office of the Inspector General [OIG] of the Department of Transportation.

On June 10, 1983 UMTA transmitted the "Technical Assessment" prepared by the Transportation Systems Center [TSC] of DOT to Dade County and requested a written response to that report by August 22, 1983. On September 1, 1983 Metro-Dade County submitted its response to UMTA's concerns and observations.

The DOT Task Force assessment only focused on a small segment of the 20.6 mile transit system. The scope of work for this project includes a review and evaluation of MDTA corrective action plans for ensuring the structural integrity and long-term durability of all structural elements for the entire 20.6 mile system. The contractor will be expected to direct resources to give priority to the in-place construction of the South Line which is scheduled for start-up operation in December, 1983.

SCOPE OF WORK

Initial work by the Consultant will focus on areas and generic categories of conditions (microcracks, cold joints, concrete consolidation, etc.). After the initial activities the contractor will proceed to: (1) Review of documentation and selected interviews; (2) Survey of construction records; (3) Review and evaluation of enhanced MDTA quality assurance and quality control oversight program; (4) Review of construction discrepencies; (5) Review of in-place construction and corrective fixes; (6) Review and evaluation of MDTA monitoring plan; (7) Audit future construction work. The contractor shall provide personnel, facilities, services, equipment, and material to carry out these work tasks.

Task 1.—Review of Documentation and selected interviews:

The contractor shall review pertinent background documents and MDTA construction management, design, plans, and specification documents related to the construction of the METRORAIL system. The contractor shall also review the OIG and DOT Task Force technical assessment reports and the subsequent response of MDTA.

The contractor shall interview selected UMTA, TSC, MDTA and Metro-Dade County officials, engineers and consultants for background information on the MDTA METRORAIL project.

Typical documentation for review and persons for interview include:

A. Documentation: (1) Project chronology (supplied by UMTA); (2) Appropriate contract drawings and specifications (supplied by MDTA). Note: There are approximately 7078 individual structural elements; (3) Inspector General's (FHWA) Report (supplied by UMTA); (4) DOT Task Force technical assessment of METRORAIL project (supplied by UMTA); (5) MDTA response to DOT Task Force technical assessment (supplied by MDTA).

B. Interviews: (1) UMTA Executive Director; (2) Associate Administrators—UMTA URT/UGM; (3) Deputy Director—TSC; (4) DOT Task Force technical assessment members; (5) Regional Administrator and Regional Engineer—UMTA Region 4; (6) Metro-Dade County Manager; (7) Executive Director other officials and staff of MDTA; (8) Metro-Dade County I.G. for Construction and Engineering; (9) MDC general and special consultants; (10) Others as appropriate.

Task 2.—Survey of construction records:

The contractor shall assess the process and procedures used by MDTA in their continuing effort to survey construction records for the entire 20.6 mile system.

MDTA is undertaking a comprehensive review of all construction records and files including resident engineer's and inspector's daily reports. The objective of Task 2 is to verify that the MDTA records review is proceeding pursuant to standard industry practices. When completed the UMTA should be advised if:

(a) A comprehensive review of all construction records and files has in fact been conducted.

(b) Problems already identified by DOT or MDTA from their records search have been correctly interpreted and appropriate corrective actions are made or are in progress.

(c) Any additional problems evident from the construction records search receive appropriate management attention.

(d) Sufficient file data is available to permit preparation of complete and accurate "as-built" structural drawings.

In evaluating this MDTA survey of construction records, the contractor shall perform the following typical subtasks:

A. Review the procedures used by MDTA to review construction records.

B. Assess the quality of the records and notes kept by MDTA staff.

C. Review MDTA concrete core boring and test specimens.

D. Review inconsistencies or instances of missing records identified by MDTA.

E. Conduct spot checks to compare records against MDTA fieldwork.

F. Evaluate MDTA's subsequent corrective actions on identified discrepancies or missing records.

G. Provide UMTA with findings and recommendations.

Task 3.—Review and evaluation of enhanced MDTA quality assurance and quality control oversight program:

MDTA has instituted changes to its construction management program, including the establishment of a separate quality assurance organization under the County Manager. The contractor shall review the MDTA's quality assurance implementation plan, evaluate the modifications for adequacy, and monitor the actions of the new quality assurance and existing quality control programs. The contractor shall perform the following typical subtasks:

A. Review and evaluate MDTA quality assurance and quality control programs including an assessment of the following items:

1. Quality Control: Level of authority of the inspectors, and whether the delegations of authority are consistent with inspector responsibilities; Level of training for both existing and new inspectors is proper for the degree of work difficulty required; Equipment provided to each inspector and logistical support is sufficient to carry out assigned responsibilities (i.e. slump cones, air entrainment, other testing hardware); Inspector's effectiveness.

2. Quality Assurance: Extent of independent authority in decision-making and enforcement; Staff qualifications, training, type of specialty; Evaluation of procedures for handling non-compliance items and comparisons of such items with specifications; Effectiveness of quality assurance in resolving nonconformance issues.

B. Review and evaluate the hierarchy of authority between inspectors, resident engineers, and quality assurance personnel with reference to effective performance of the quality assurance and quality control program.

C. Determine the volume of construction handled by the quality assurance program and assess if the resources are sufficient to ensure quality construction.

D. Spot check actual performance of quality control program by reviewing inspector's records, record-keeping procedures, and completion of records.

E. Spot check field records to assess if record-keeping is orderly, complete, and retrievable.

F. Recommend any necessary UMTA actions based on observations.

Task 4.—Review of construction discrepencies:

Some construction discrepencies may not require corrective action if analyses indicate that they do not significantly impact the load-bearing capacity or service life of effected structural elements. MDTA and its consultants are conducting analyses of the system design and the "as built" condition of structures to determine the appropriate course of action (i.e., repair, replacement, post-construction monitoring or no action). The contractor shall review the design calculations in order to determine that the appropriate corrective actions are being or have been taken by MDTA. The contractor shall conduct the following typical subtasks:

A. Selectively review and evaluate MDTA design calculations to determine if the MDTA has assessed the design changes made during the construction and that the corrective actions have been or are being made pursuant to standard industry practices.

B. Perform an independent evaluation of critical structural elements that are most sensitive to construction deficiencies (e.g., hammerhead piercaps, double "T" girders, and box girders).

C. Determine if the MDTA recommended corrective actions for each of the construction discrepencies are consistent with industry standards.

D. Provide recommendations to UMTA.

Task 5.—Review of in-place construction and corrective fixes:

MDTA has initiated a program to review the construction quality of all in-place structures. This program has identified through use of destructive and non-destructive testing the actual placement of selected steel reinforcement, strength of concrete, and degree of consolidation. The contractor shall review these activities along with all the critical repairs and subsequent corrective fixes to determine if problems are properly dispositioned and that any corrective repairs have been completed in accordance with accepted industry standards. The contractor shall determine those structures or structural elements which may have the potential for significantly reduced durability due to construction discrepencies. For those structures or structural elements identified, the contractor shall determine if the in-place structures have been examined, tested, and reviewed by MDTA to determine that construction deficiencies have been identified and resolved. Where a corrective action or no further action is recommended by MDTA, the contractor shall review the basis for such decisions to determine if they are consistent with the appropriate design analysis specified in Task 4.

The contractor shall evaluate the proposed structural test procedures and techniques for determining the adequacy and the acceptance of any repair work. The focus in this task is to verify that the MDTA has properly identified the types of load tests, necessary to assess the load-bearing capacity of the structures. The contractor shall evaluate past tests, witness future tests and evaluate results. For those construction discrepencies that MDTA has identified, the contractor shall inspect the in-place repairs with respect to compliance with accepted industry standards. The contractor shall employ acceptable testing techniques, as necessary, to aid in the assessment of repairs. The contractor shall conduct the following typical subtasks:

A. Review the analysis performed by MDTA on existing structures (from data developed in Task 4).

B. Review structural tests performed on existing structures.

C. Evaluate if additional analyses are needed to determine if further testing is required.

D. Recommend additional analyses or testing to UMTA, as required.

E. Determine if repair procedures, plans, specifications, and methods undertaken by MDTA are within acceptable industry practices.

F. Spot-check selected in-place repairs to determine that standards are satisfied as developed in Task 5 above.

G. Determine if proposed repair activities meet standards developed in Task 5 above.

H. Provide weekly progress reports and daily telephone contacts to UMTA on status of above subtasks.

I. Provide monthly reports that detail daily MDTA activities including problems, methods, and status of resolution.

Task 6.—Review and evaluation of MDTA monitoring plan:

A monitoring program is a prudent long-range engineering performance evaluation procedure for public structures. The contractor shall review MDTA's proposed plan for long-term monitoring during revenue operations. The MDTA monitoring plan shall be evaluated to be sure it includes a definition of the critical parameters, field measurement approach, and the criteria for determining if and when a specific corrective action is needed. The contractor shall conduct the following typical subtasks:

A. Review and evaluate MDTA construction monitoring program for all in-place structures.

B. Inspect and assess at random locations the MDTA monitoring methodology, execution, and initial field measurements.

C. Provide UMTA with appropriate recommendations.

Task 7.—Audit future construction:

The contractor shall audit the implementation of the MDTA Quality Assurance/Quality Control program for the construction work in progress for the balance of the Metrorail system.

Task 8.—Project implementation plan [PIP]:

A project implementation plan shall be developed which shall be submitted to UMTA for review, comment and approval. The PIP shall include the following:

A. A description of each work task. The work description will define the proposed approach, describe the means and source of data collection (including outside organizations and UMTA personnel to be contacted), specify the analysis to be undertaken and describe the expected products or results.

B. Individual personnel assignments and man-hours budgeted for each task.

Milestones and schedule for each task, deliverables, and briefings to UMTA.

Mr. MOLINARI. I just have one further quick line of questioning, and that is, does Morrison-Knudsen——

Mr. LARSEN. I will make it easier for you. Call it MK. Everyone in the industry does.

Mr. MOLINARI. MK. We have a little aversion to abbreviations in our subcommittee, but MK, I see, has a very impressive record of engineering and construction projects.

Mr. LARSEN. Yes. One of the projects that I was associated with was called MKSAC, the King Khalid Military City, if you are aware of it. The Corps of Engineers acted as the representative for the Saudi Government. If I remember correctly, at the time we signed that contract, it was the biggest individual contract that the Corps of Engineers had ever let. I was director of engineering on that particular project. We did both the engineering, the construction management, and a major portion of the construction for that contract.

Mr. MOLINARI. I thought I understood you to say that you didn't agree with the conclusions that were reached in the Engineering News Record article that Mr. Levitas earlier introduced.

Mr. LARSEN. That is what I said, but the gist of the article was that the engineers should do the construction management. That presupposes that the engineers have construction experience. It has been my experience that most engineering firms do not have construction experience. MK is unique in that we are not only one of the largest construction firms in the world, we are also one of the largest engineering firms, and have a very good reputation both domestic and international.

Mr. MOLINARI. Don't most major construction companies in this country have large engineering components as well as construction components?

Mr. LARSEN. Not to my knowledge. Most large construction firms have engineering capability, and I will say I am not familiar with every construction firm, nor with all of their subsidiaries, but I don't know of another construction firm that has an international engineering company as a wholly owned subsidiary.

By the way, we own H.K. Ferguson, which is one of the largest piping process engineering and CM firms in the United States, so it is a little different. What I said was, and certainly what I meant to imply was, that my own personal feelings are that if you are going to do construction, you have to have had your boots on and get them dirty before you know how to tell someone else how to do it.

Mr. MOLINARI. I understand. I think that is well put, and thank you for your testimony.

I have no further questions.

Mr. LEVITAS. Thank you, Mr. Molinari.

Dr. Rowland.

Dr. ROWLAND. I just have one question and you may have answered this and I missed it, but is this the first instance in which MK has been under contractual arrangement with UMTA?

Mr. LARSEN. Contractual arrangement to monitor and review?

Dr. ROWLAND. Yes.

Mr. LARSEN. Yes, to the best of my knowledge. I have to say yes because the decision was left up to me as to whether or not to accept the contract, so I assume there has been nothing else in the past.

Dr. ROWLAND. Thank you.

Mr. LEVITAS. Mr. Nowak.

Mr. NOWAK. Thank you very much.

The firm has certainly a reputation outside of this State or this Nation. When you spoke to the point of your experience with this contract, limiting it to this contract, is there anything that you have found since you have been looking at the testing results, or anything else in either your field experience or office experience which would lead you to any conclusion about the safety of the system, or about any material discrepancies from the specifications to the performance of anything you have looked at?

Mr. LARSEN. To address the first part of your question as regards the safety of the system, with the present program as enacted, which is identification of problems and correction of the same, this system can be made to meet all original design criteria. That includes the safety criteria that would have been involved.

Regarding anything else, I would submit to you that probably we haven't had enough time to do a full evaluation of some of the other areas you are asking about. If you have specifics, perhaps I could address them.

Mr. NOWAK. Let me state the question another way.

Does your contract cover enough of the detail of the complete constructed system, in 6 months for the first stage, as you mentioned, and perhaps a year from now finally, to make a very substantial judgment that the system will have been built within the specifications that were put out to bid?

Second, that this system is a safe one based on those specs?

Mr. LARSEN. First, let me point out that when we negotiated the letter contract, we were very careful not to put in that letter contract that we will insure that the system is complete, safe, and so forth. Our letter of contract asked us to assure UMTA that all reasonable things have been done, and that is our intent. I cannot come on to a $1 billion project with what amounts to half a million dollars funding at this time, and duplicate all the design efforts of KTG that were conducted under, I think I heard the figure of $100 million plus.

We will give UMTA a report that essentially gives our evaluation of what has been found and what is to be corrected, and to the best of my knowledge at this time, certainly there is an attempt to identify all problem areas and all construction deficiencies, and to correct the same.

Is that responsive to the question?

Mr. NOWAK. Let me follow that up with one more question. When you have looked to the degree that you have, is there any work that you are aware of that could not be corrected because of

or the fact is that it is outside of the area of performance. Are you aware of anything in the future that that could be a question to this?

Mr. LARSEN. Congressman, I hate to be evasive, and I would like to answer the question specifically as you have stated it, but basically it is very difficult for me to do.

We have identified some areas that we feel need additional evaluation by us or someone else, whomever. With that evaluation, and again with the evaluation of the defective areas that are identified, the system should be safe, it should meet original design critiera, and I would personally ride on it any day of the week.

Has that answered your question?

Mr. NOWAK. The point I am trying to get at is you know there is a great deal of worry if major deficiencies are found. My understanding from your testimony is that your 2 months of involvement have not found major deficiencies in the system, which would sacrifice safety of the system, and if there were problems, they are of a minor nature that either could be the subject of a lawsuit, or compromise, or negotiation, or conference to find a remedial method to fix whatever is there. But in the event that there are larger problems, what I am trying to allude to is that the taxpayers won't again be called upon. In each phase of this construction, there has to be many, many performance bonds that if proven in court would be able to make the county whole or vice versa.

If there is a problem, you start off anew. You have got a bond out there that is sitting behind most of these contracts, and I don't think the general public is aware of this. They see that there may be a problem. They say, "Well, it will cost millions and millions of more dollars."

Mr. LARSEN. That contractual evaluation, if you will, was specifically excluded from my task, so I have done no review of the various construction contracts that exist, nor is there any intent on our part to do the same.

Mr. NOWAK. I know it is not within the purview of your contract according to the areas that you have listed here, but I am just trying to bring out the point that in the event of major breaches or major lack of conformity to specifications, there are performance funds that may make the funding of this whole through either lawsuits or other methods of negotiation on behalf of the county taxpayers, and State taxpayers, and in our instance, Federal taxpayers as well.

Mr. LARSEN. I would suspect that you are correct. Again, we have not reviewed that specific area. I would state that in all probability, because of the complexities of some of the problems that have been identified, and I would not term them all insignificant, sir, that because of the complexities of those, some of this will be resolved in litigation, and again that is not an area we have been asked to look at.

Mr. NOWAK. Thank you.

Mr. LEVITAS. Mr. Lehman.

Mr. LEHMAN. Thank you.

The Inspector General's report, the way I understand it, is still about 2 months away from being finalized. I suppose I should ad-

dress this to UMTA, but to what extent is your effort duplicating the Inspector General's effort?

Mr. LARSEN. I really can't respond to that. You will have to address it to UMTA. One of the tasks we have been asked to perform is to evaluate a comparison between the TSC report and the MDTA report.

Mr. LEHMAN. And the second question, can you assure me that MK is getting full cooperation and assistance from the Miami-Dade Transit Administration in your efforts to complete your job?

Mr. LARSEN. Yes. I can give you full assurance on that.

Mr. Stierheim, Clara Oesterle, Jack Crognale, everyone within the MDTA organization has been very cooperative with us. We have no responsibility for or authority to force anyone to do anything. We do find that we get a great deal of cooperation by simply suggesting in our report to UMTA we would like to see certain things, and we get immediate response. Everyone down here has just been super to work with.

Mr. LEHMAN. Thank you very much.

Mr. LEVITAS. Thank you, Mr. Lehman.

Did I understand you to say that one of your tasks is to evaluate the TSC report and the MDTA report?

Mr. LARSEN. Yes. As a matter of fact, that is task 1.

Mr. LEVITAS. The additional evaluations that you feel should be performed, are those the ones that you feel can be accomplished within 6 months?

Mr. LARSEN. You are speaking of areas where we have identified that there may be other areas?

Mr. LEVITAS. Yes.

Mr. LARSEN. Yes. They could be done—as I said, they could be done by us. They could be done by another consultant for MDTA. No problem with accomplishing those in 6 months.

Mr. LEVITAS. And have these areas been identified to MDTA?

Mr. LARSEN. We have had discussions with MDTA and UMTA of areas. We don't really have concern but maybe a little question is all.

Mr. LEVITAS. I have no further questions.

Mr. Molinari?

Mr. MOLINARI. I have no further questions.

Mr. LEVITAS. Mr. Larsen, thank you for your testimony. It has been very good testimony. I don't know that I have yet absorbed everything, but I must observe that I don't think you were evasive. I think you were being careful and precise in your responses, and as such, I think it is important for us to look at precisely what you did say in light of the questions that you were being asked because I think what you have contributed is of some real importance to what we are trying to find out. I want to thank you for your presence here today.

Mr. LARSEN. It has been my pleasure.

[Mr. Larsen's prepared statement follows:]

STATEMENT OF W. KENT LARSEN, PROJECT DIRECTOR, MORRISON-KNUDSEN CO., INC., CONSULTANTS TO UMTA

Mr. Chairman, I am happy to be here today to make the following presentation. On October 10, 1983, Morrison-Knudsen Company, Inc. [MK] signed a letter contract

(DTUM60-84-C-71239) with UMTA to act in a consulting role in reviewing, monitoring and reporting on the Dade County Metrorail transit system.

Negotiations were conducted with the UMTA Washington and Regional Staffs and MK was directed to report through Mr. Gene E. Carroll, Director, Office of Management and Technical Assistance, who in turn reports to Mr. James A. O'Connor, Regional Administrator, both in the Atlanta Regional office.

The decision to employ MK as a UMTA consultant was reached after a "Technical Assessment" prepared by the Transportation Systems Center [TSC] of DOT was issued and the corresponding response by Metro-Dade County Transportation Administration [MDTA] was received.

The scope of work outlined in Attachment "A" to the letter contract directed MK to focus on generic areas of categories such as microcracks, cold joints, concrete consolidation, etc. After these initial activities, MK was to complete the following tasks:

Task 1—Review of documentation and perform selected interviews during which comparisons will be made between the TSC Report and MDTA's reply.

Task 2—Survey of construction records with the object of verifying that the MDTA records review is proceeding pursuant to standard industry practices.

Task 3—Review and evaluation of enhanced MDTA Quality Assurance [QA] and Quality Control [QC] oversight program. This review and evaluation is meant to verify the adequacy of the implemented QA and QC programs.

Task 4—Review of Construction Discrepancies. A confirmation of the acceptability of the methods employed in the evaluation and correction of defective structures will be accomplished.

Task 5—Review of In-Place Construction and Corrective Fixes. This action also includes review of load testing of existing structures where required.

Task 6—Review and Evaluation of MDTA Monitoring Plan. This includes the evaluation of the long term monitoring plan for the structural system when operations begin.

Task 7—Audit Future Construction. Implementation of the MDTA QA/QC program for the remaining construction activities shall be audited.

Task 8—Project Implementation Plan. Development of the P.I.P. shall be accomplished under this task.

During negotiations of this contract, it was agreed that while MK would have no direct authority or responsibilities in connection with MDTA, there would be complete and open communications.

Morrison-Knudsen brings unique qualifications to this project. Founded in 1912 in Boise, Idaho, MK has grown to become one of the largest and most experienced engineering and construction organizations in the world. In the April 28, 1983 Engineering News Record, Morrison-Knudsen was ranked on a world-wide scale as number one in heavy construction and fifth in program and construction management. Our wholly-owned subsidiary, International Engineering Company, Inc., is ranked number two in international design by Engineering News Record. During its 70 plus years of existence involving successful performance in 72 countries and in all 50 states of the United States, MK has never defaulted on a contract.

The 1982 combined gross revenues of Morrison-Knudsen were $2,360,909,000, with a December, 1982 contract backlog of $3,177,300,000. Engineering and construction projects completed over the past 71 years of operations total well over $25 billion. Morrison-Knudsen is presently engaged in over 350 projects in various states of design, engineering, procurement, construction and project management through the world.

The Morrison-Knudsen organization has a professional staff of 3,000 key engineering and management personnel which support a worldwide team of more than 19,000. In addition, it operates one of the world's largest fleets of construction equipment, approximately 6,000 units, with a current replacement cost in excess of $500 million.

The listing of MK's projects would fill a volume the size of New York City's telephone directory; however, two of MK's recent projects with which the committee may be familiar are the Washington Metro Subway and Walt Disney World's EPCOT. Chances are good that during your daily commuting to Washington, D.C., you passed over a great deal of our work in progress on the Metro-Subway system. Among the projects completed by MK at EPCOT, was the 8 miles of elevated monorail. MK performed design review, designed, constructed and operated the precast plant, and performed all phases of construction for the monorail. These tasks were accomplished in such a manner that we were able to begin operation of the system 4 months ahead of schedule.

The EPCOT project was my most recent construction project and included 3 major firm price contracts totalling over $90 million. All three contracts were completed ahead of schedule.

I am a civil engineer and am currently a licensed Professional Engineer in 6 states with a General Contractor's license in the State of Florida. It has been my good fortune to have experience on both sides of the construction table, having served Armco Steel Corp. as Senior Engineer of Construction during their major modernization and expansion in the late sixties. During this period, several CM firms performing major projects in 6 states reported to my office. Since leaving Armco, I have served in various construction capacities in the industry. My experience with MK includes both international and domestic assignments with projects ranging from nuclear to more recently heavy involvement in the transportation industry. This experience includes management of major projects where MK performed as the Program Manager, the Construction Manager, or as a firm-price prime contractor.

Under the scope of our contract with UMTA, we have been tasked with a review, monitoring and reporting function. Accomplishment of these objectives has made significant progress, and the cooperation extended by Manager Stierheim and the MDTA staff has contributed to this progress. The existence of construction discrepancies and associated management problems had been documented prior to our arrival. Manager Stierheim and the MDTA staff had begun an effort to identify substandard activities and to correct same. A reorganization and realignment of the Quality Assurance program had begun. As regards identified problems and potential unknown problems, I am confident that the monitoring and identification process implemented will be adequate to assure the completion of the system to required criteria. The identification and correction process will continue to be a dynamic operation with the requirement to maintain flexibility in resolving newly identified problems.

In my first meeting with Manager Stierheim, Commissioner Clara Osterle and UMTA staff personnel, I made the statement "There is nothing out there that cannot be fixed." During the last 2 months, nothing has occurred to cause me to change that early evaluation. The Metrorail, when corrected and completed, should be a safe and efficient system. In other words, with the continuation of the program presently under way, this system can be made to conform to all design criteria and further to meet all original safety standards. It further will fill an existing need and should be a thing of pride to Dade County and its residents.

The question has been asked, "What is the optimal program for program management, construction management, quality assurance and quality control?" Unfortunately, there is no standard answer to any given part of that question. Each project is unique and while many aspects of various construction projects may be similar, it requires qualified and experienced managers to properly administer any projects. In general, the larger the project, the greater the need for outstanding managers.

Let us define some of the terms used earlier:

Program Management—The function of managing and/or performing all segments of a project from design through construction completion.

Construction Management—The function of managing the construction phase of a project.

Quality Control—The physical act of performing various quality tests and inspections during construction.

Quality Assurance—The administrative function which verifies the existence of control procedures and the correct application of these procedures as well as the implementation of the quality control program.

In my opinion, one area that requires greater attention for major construction projects is the selection of Program or Construction Managers. Too often the selection of these managers is structured such that in many cases, selection goes to engineering firms. One of the reasons for this is the early involvement of engineering firms in study and preliminary stages. If the firm performs well and maintains a good client relationship, then it is only natural for the client to wish to maintain that relationship during any construction manager selection process. Unfortunately, not all engineering firms are qualified construction or program managers. To be a qualified construction or program manager, it is necessary for the selected firm to have extensive construction experience and for the assigned personnel to understand all phases of construction. Such things as constructibility review and value engineering require an intimate knowledge and hands-on experience to be properly performed. You cannot manage what you do not understand. Conversely, a construction firm should have engineering design experience when pursuing program management projects.

Any major project undertaken today should have clearly defined and implemented Quality Assurance and Quality Control programs. While portions of the quality control program may be safely delegated, it is imperative that the quality assurance program be maintained by the prime entity. The quality assurance function should be *separate from construction operations* with commitment from the highest staff level and access to that level.

In summary, any major construction project should be staffed by the best available experienced and qualified construction managers. Without construction experience, the chances of failure are substantially increased. As a comparison, if you can drive a car that does not imply that you can build a car. There will be a great many major transit projects in the future and it is hoped that the information presented here can in some small way contribute to the success of these future projects.

Mr. Chairman and members of the Committee, I will be pleased to respond to any questions.

Mr. LEVITAS. Thank you. I have no further witnesses to call today.

As I announced earlier, we may have continuing hearings on this and the related larger areas of inquiry that this hearing initiates today. It has been an extremely useful day, and I am very pleased with the record. I know that I have learned a great deal from what we found out here in Miami, and hope that these hearings have made a contribution to what all of us want to achieve, and that is specifically in this area the early completion of a reliable, efficient, safe, and cost-effective transit system by the Metro-Dade Transportation Administration. This hearing has also shed a great deal of light on what I think UMTA needs to be doing and what we in Congress need to be providing by way of direction and authority.

I would like to again express our appreciation to the officials of Metro-Dade, and especially to our colleague, Bill Lehman, for bringing this about and making such an important contribution to today's proceedings. We will keep the record open for 2 weeks for additional material to be submitted by any interested parties.

If there is no further business to come before the subcommittee, the subcommittee stands in recess subject to the call of the Chair.

[Whereupon, at 5:30 p.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.]

(The following letter was submitted for the record by Mr. Sarosh S. Dhondy, who served as assistant chief structural engineer for the Kaiser Transit Group.)

Mr. Warren J. Higgins
Transportation Executive Director
Metropolitan Dade County
44 West Flagler Street, 17th Floor
Miami, Florida 33130

November 26, 1983

Dear Mr. Higgins:

Sub: Testing of Standard Hammerhead Pier Caps

We have come a long way since March '83 when you and your staff joined Mayor Clark, Manager Steirheim, Commissioners Oesterle, Phillips and Redford, and KTG Director Schimpeler in denying vehemently that there are serious construction errors in many standard hammerhead pier caps.

The UMTA-commissioned TSC report issued in June '83 confirmed or recommended for further investigation all my findings, and your 38-man Technical Audit Team has worked well over 6 months to confirm that construction defects in hammerhead pier caps, both standard and non-standard, are pervasive in nature, leading to DCTA decision to demolish at least 3 caps, with further testing to determine the remedial repair work required on another 30 caps. The total money, man-power and time expended since March '83 by Federal and County agencies on testing/evaluation work on the guideway and stations has considerably overshot the $2 million, 24-engineers and 6 month mark, an estimate I forecast in March '83, which was then subject to disbelief and derision by all the County officials.

Now for the main subject of my letter. I have observed on 11-21 and 11-22-83, the testing of incorrectly-built Standard Hammerhead Pier Cap Type TT No. H 2598 (condemned by DCTA for demolition) under the supervision of your consultant, Mr. Guedelhoefer of RRJ. The object of the test was to put on controlled loads to determine the performance of the south half of the east ledge of the cap, which I was given to understand, was constructed in conformance with contract drawings and specification tolerances; thereby, the test was planned to evaluate whether the design itself meets criteria requirements. As the former Assistant Chief Structural Engineer of Kaiser Transit Group and the lead structural analyst for the standard hammerhead pier caps, I submit that the test loads applied to simulate peak operational loads, outboard derailment and required Group D ultimate strength requirement were all below criteria definitions. The technical rationale behind my statement is detailed in the attachment to this letter.

You will note that if indeed this ledge has been properly constructed, my statement would mean that the load tests conducted so far do not necessarily validate or invalidate the design of the standard TT pier cap ledges, whereas Mr. Guedelhoefer's preliminary assessment, as conveyed to the media, was that this ledge did perform as required by criteria. As such, you will appreciate that my own statement may act disadvantageously in design validation; however, the objective is to determine the true load-bearing capacity of this difficult design in which available technical recommendations are contradictory or vague. Naturally, one of the prime concerns of Kaiser Transit Group, the engineers on record, is to validate the design. At the same time, apart from everyone's concern to restore structural strength and integrity of the system, DCTA has the added onus of recovering extra expenditure from at-fault contractors or at-fault designers (KTG or Section designers) or a combination of the two sources. While DCTA's intent is altruistic, it is non-pragmatic to expect to recover more than a very small portion of the extra expenditure involved, mainly due to divided responsibilities, as explained in the next paragraph.

The original transit referendum scheduled the opening of the entire Stage I system (South and North legs) for June 1984. In order to accommodate

cont'd...

construction delays that had occurred upto March 1982, DCTA compensated the original schedule by accelerating the scheduled opening of the South leg from June '84 to December '83 and postponing the opening of the North leg from June '84 to December '84. As you are aware, the South leg now will perhaps open in June 1984, and in my opinion, the problems in the North and Hialeah corridors will not permit the North leg to open till December 1985 at the earliest, approximately 18 months later than the transit referendum schedule. There are several contractors (e.g. RTJV, William Smith, etc.) who are not at all involved in the pier cap fiasco and their work (girder erection, trackwork installation, etc.) is at a total standstill. DCTA has failed to meet construction schedules defined in their contracts with these not-at-fault contractors, who have already filed claims or intend to file claims to the accumulative tune of $700,000 per month of delay. Add to this the cost of extended employment of several engineers and construction supervisors on DCTA and KTG payroll, and one can conclude that Dade County is faced with at least $1 million extra expenditure per month of delay in opening the North leg, an estimate which excludes the actual cost of testing/demolition/rebuilding/repairing the pier caps, and the financial loss due to deferred development of areas adjacent to the transit corridor. Would you please inform the public as to how you propose to recover this amount, possibly to the tune of over 20 million dollars, from at-fault contractors and/or at-fault engineering firms? Your objective is unrealistic, to say the least.

In the above context, and as our views on testing procedures are so totally polarized, I request you to convene, on emergency basis, a small blue-ribbon panel of independent structural design specialists familiar with DCTA criteria, to review the test load schedule set up by RRJ, thereby ensuring a fully technically endorsed evaluation of the pier cap fiasco. In this connection, please note that while the UMTA-appointed oversee-firm of Morrison Knudsen Inc. are well-established specialists in all disciplines of heavy construction engineering, they are not transit structural designers, per se. If DCTA test procedures are not reviewed on an emergency basis, I feel that you will leave the gray cloud of structural safety or otherwise, still blanketing the system.

I am sending copies of this letter and attachment to concerned citizens, engineers and officials, DCTA's wrap-up insurance carrier and many reporters of the Miami communications media, with the earnest hope that one or some or several of them will feel it within their purview of civic duty to influence you to do the right thing for the system, despite the adversary positions that DCTA and I have taken in the past. As testing of condemned Cap H 2589 is scheduled for the middle of next week, an immediate decision on your part is mandatory.

I now await your valued and prompt reply.

Yours sincerely,

Sarosh Dhondy

Encl: Technical Attachment

S. S. Dhondy, M.Sc. (London), Chartered Engineer, M.I.C.E.
9820 S.W. 158th Street
Miami, Florida 33157
Tel # (305) 238-4897

TECHNICAL ATTACHMENT (to letter dated 11-26-83 from S. Dhandy to W. Higgins)
Page 1 of 9.

LOAD TEST CRITERIA FOR STANDARD HAMMERHEAD PIER CAP TYPE TT

I. Basic logic for Load Testing of Ledges of Type TT Pier Cap

The actual total effective mild steel and structural steel reinforcement provided in any 'exterior quadrant' (Fixed end or Stressing end) of the stems (webs) or ledges of any Standard Hammerhead Type TT Pier Cap is independent of tract centers (13'-4" max.) or span lengths (max. 82'-6") or radius of curvature of track (1000 ft. min. as per design); there are differences in location, placement of the steel dependent on these variables, but these differences do not change the behavior of the ledges. Also, the amount of longitudinal post-tensioning of the cap is very much dependent on these variables, but, again, this does not significantly affect the behavior of the reinforced concrete ledges, particularly at high overloads. As such, any type TT ledge, properly constructed in conformance with Contract Drawings and Specifications, is supposed to satisfy the following common parameters:

(a) Maximum dead load girder reactions from the longest (max. span = 78'-6" ℄ bearings) type 3DS double-tee girders with weight of 200 kips per girder.

(b) Superimposed dead loads of 1000 lbs/lft/track which reduces to about 800 lbs/lft/track in the case of outbound derailment which knocks down the acoustical barrier.

(c) Centrifugal forces and maximum temperature forces corresponding to the sharpest curvature of track (R = 1000 ft. as per design).

(d) Repetitive operational loading groups I and III due to the passage of 125,000 six-car trains with 100% crush live load. In addition, the ledge should sustain repetitive reduced Group I loading (78% to 89% of crush live load) from 2.9 million six-car trains and 1.3 million two-car trains.

(e) The ledge should have an ultimate strength capacity equivalent to Group D loading (Derailment) with a 10% overload factor on dead loads and a 40% overload factor on design derailment live load (100% impact included) with coexisting longitudinal braking/traction forces and transverse centrifugal forces (R = 1000 ft). Derailment should allow for a maximum 3'-0" lateral excursion parallel to the track; thus, the lateral excursion measured from the Reference line of the pier cap can be as much as 3'-6" for axle loads near girder supports, for R=1000 ft case.

(f) As far as longitudinal placement of the car axles is concerned, one of the worst cases for ledge loading is sketched on the next page with the rear axle of the front truck of an 'inner' car (not the 'lead car' or the 'rear car') of a 4or6or8-car train located right over the extreme longitudinal edge of the girder supported on that ledge under test load. This most severe

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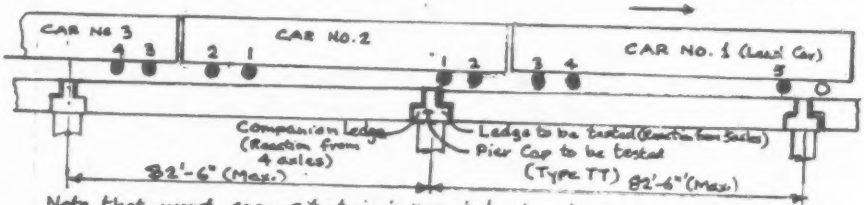
axle-placement case can be repeated twice in a 4-car train, four times in a 6-car train and six times in an 8-car train. The sketch shown below is one of the two cases of a 4-car train when the ledge to be tested is on the "lee-ward side" of the direction of motion of the train, as in the case of the South-East ledge of test Cap No H-2598. However, if the ledge to be tested is located on the "wind-ward side" of the direction of motion of the train, then the worst case occurs when the front axle of the rear truck of an 'inner car' is located at the edge of the girder supported on the ledge to be tested. Note that in either case (windward or leeward test ledge), the test ledge supports the reaction from 3 axles, whereas the companion ledge of the same cap gets a smaller reaction from 4 axles. Note that a 2-car train cannot create one of the worst cases, as then the companion ledge gets a much smaller reaction from only 2 axles; as the action of the test ledge and the companion ledge is definitely inter related, more significantly under high overload conditions, it is necessary to load the companion ledge to the coexisting maximum load as sketched below.



Note that worst case situation is repeated when train moves forward by 75 ft.

•II• Load Test Data for East Ledge (South Side) of Cap No. H-2598

	OPERATIONAL LOADS (LIMITS SET ON LIVE LOAD ONLY)	DESIGN DERAILMENT (OUTBOARD)	REQ'D ULTIMATE STRENGTH (GROUP D - OUTBOARD DERAILMENT CASE)
1 KIP = 1000 POUNDS	WEST EAST	UNFACTORED LOADS (1.0 DEAD + 1.0 LIVE) WEST EAST	FACTORED LOADS WEST EAST
Total reaction/track			
VERTICAL LOADS ONLY SHOWN FOR HORIZONTAL FORCES REFER IV			
ASSUME MAX. DESIGN EFFECTS OF 82'-6" (BOTH FIXED AND E = 1000 KSI)			
GIRDER SELF LOAD (30S)	100K + 100K	100K + 100K	110K + 110K (1.1)
SUPERIMPOSED DEAD LOADS (FIXED)	40K + 40K	NO BARRIER 32K + 32K	NO BARRIER 36K + 36K (1.1)
LIVE LOAD (TRANSMITTED) (100% CRUSH LIVE LOAD)	(0.92 Ew) ACT INCL. 40K + 120K	(100% IMPACT INCL.) 64K + 194K	90K + 272K (1.4)
TOTAL REACTION/TRACK (SOUTH CANTILEVER ONLY)	180K + 260K	196K + 326	236K + 418K (REFER III)
REQ'D TOTAL LOAD ON LEDGE OF SOUTH CANTILEVER	440K	522K	654 K
REFER III FOR DISTRIBUTION OF THESE LOADS BETWEEN OUTBOARD & INBOARD BEARINGS	ER = (440,000 pounds) REFER NEXT PAGE FOR INCREASE REQ'D TO ACCOUNT FOR EFFECT OF REPEATING LOADING.	ER = (522,000 pounds)	EQ = (654,000 pounds) REQ'D ULTIMATE STRENGTH (REQ'D TOTAL LOAD ON SOUTH CANTILEVER)

ER = Reaction per track = Sum of Reactions on Outboard & Inboard Bearings

As time-and-money constraints on testing prohibit placement of operational loads more than (say) 10 times instead of the several millions of cycles of repetitive loading projected to occur during sixty years of service life, an equivalent static overload pattern should be developed to create the same cumulative damage as the repetitive loading spectrum defined in I(d) on page 1.

Sequential loading pattern should be as follows. A single or two static operational peak load (with adjusted overload for repetitive loading) test, hereinafter referred to as 'equivalent operational load', should initiate the test, followed by the unfactored derailment (100% impact included) load test (ΣR = 522,000 pounds). If residual cracking is severe enough (after removal of load) to warrant repairs, then repairs should be made at this stage or alternatively, testing should proceed without any repairs, or very minor repairs. Then the test should be resumed by applying the 'equivalent operational load' 8 or 9 times and extent of cracking observed after each cycle. Finally, the cap ledge should be tested for ultimate strength requirement (ΣR = 654,000 pounds) building up the load gradually. Note that unfactored derailment load (ΣR = 522,000 pounds) should be sustained for not more than a short period (preferably 2 to 3 minutes only which would mean quick monitoring/measurement) after which the load should be reduced by 129,000 pounds $\left[\frac{(194+64)}{2} \text{ kips}\right]$ to ΣR = 393,000 pounds to eliminate the 100% impact effect. This test schedule would give an excellent understanding of the behavior of this crucial structural element and would also indicate whether major structural repairs would be required following an actual derailment of intensity and excursion equal to the design derailment forces. Incidentally, please note that ACI testing procedures (measuring deflections and recovery at definite under 50% of the load etc) are considered totally inapplicable to guideway structural members designed for fatigue resistance under repetitive loading.

III. Distribution of Test Loads Between Outboard and Inboard Bearings

This is the all-important factor in testing criteria. Transverse horizontal forces (wind on structure and train, nosing forces from the cars, and centrifugal force/temperature forces on curved track) and vertical loads with transverse eccentricity (unsymmetrical superimposed dead loads and wheel loads with lateral excursion under derailment) cause equal ± reactions on the outboard and inboard bearings, depending on the torsional behavior of the girders. A relatively conservative approach, based on rigid body behavior, was used in the design of the pier caps and the total ultimate strength (Group D) load requirement of ΣR = 418 kips from the inbound track on the East ledge (South side) was applied entirely to the outboard bearing with zero load coexisting on the inboard bearing which is equivalent to a plus (+) downward reaction of 209 kips on the outboard bearing and an uplift

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of −209 kips on the inboard bearing for Group D loading. Admittedly, this design approach is conservative and a more realistic approach can be developed using test data obtained during full-scale testing of the double-tee girders at P.C.A. Skokie, Illinois. HOWEVER, I HAVE STRONG OBJECTIONS TO THE INCORRECT & INAPPLICABLE FINITE ELEMENT MODELS (MICAS 435-P10 or ANSYS PCA 485C) USED BY RRJ. To substantiate my statement, refer to Fig. V-B-1 page 29 of Appendix E Part I of DCTA response to the TSC comments report. This figure (and computations for the MICAS & ANSYS model(s) has been prepared by RRJ and the computed deflection values highlight the glaring underestimate of torsional rotation which would occur when only 50% of the design derailment load (100% impact included) is placed symmetrically about mid-span (1 coupler of 2 cars located at midspan) but with an transverse eccentricity of 3'-0". Note that if the transverse eccentricity is eliminated totally (i.e. loads are symmetrical about midspan as well as ℄ girder) then both stems would deflect equally by about 0.58" (as per PCA test data) for (1×CCL) live load (≃80% of crush live load including 24% impact which in the PCA tests gave measured deflections of 0.73"). Subtracting this P.C.A. measured deflection of 0.58" from the values shown in RRJ Fig V-B-1, one obtains the following midspan deflection of the more heavily loaded stem due to torsion only caused by (1×CCL) load with zero longitudinal eccentricity (1 coupler of 2 cars at midspan) and 3'-0" transverse eccentricity.

P.C.A Full-Scale Tests: +0.19" (0.77" − 0.58")

RRJ Computations [MICAS (435-P10) Finite Element Model: +0.04" (0.62" − 0.58")
ANSYS (PCA 485C) : +0.14" (0.72" − 0.58")

↑ Values from RRJ Fig V-B-1

Thus at (1×CCL) load with e = 3.0 ft (girder is uncracked or nominally cracked with cracks closing up on removal of overload), torsional rotation is underestimated by about 75% using the MICAS model and by about 25% using the ANSYS model. So, you can imagine how gross the errors would be at high overload values of (2.0×CCL) (Design Derailment) and (2.8×CCL) (Ultimate Strength-Group D). Yet RRJ concludes on page 24 of the report that there is close enough agreement between PCA test data and the ANSYS/MICAS models. Surely, RRJ will concede that one does not need a finite element analysis model to compute deflections of a simply supported beam without any applied torsion, as long as EI value is known. Then, the results of the balance deflection (due to torsion only) are tabulated above and these highlight the glaring errors in using finite element analysis models, with errors being supersignificant at high overloads,

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IV. Longitudinal Horizontal Forces:

For group D ultimate loading, a horizontal force of 23000 pounds (T_u) (longitudinal) at bearing level has to be created on the outboard bearing of the East ledge with smaller forces for the other 3 bearings of the South Eastern of the cap. Similarly, smaller (computed) horizontal forces have to be applied for operational and design derailment load cases. I did not see any attempt to simulate this horizontal force in the test.

I. Contact Bearing Areas

Admittedly, the plan contact bearing areas should be 10"x16" (R=1000ft) (and not 10"x14") as loads corresponding to R=1000ft are recommended for the use of testing any ledge. However, in the case of derailment ultimate loads, the jacks for both outboard bearings should be offset 2" to 3" (exact value to be computed) transversely from the bearing towards the fascia edge of cap stem in order to create the required trapezoidal loading pattern these bearings would be subjected to for these high overload cases.

VI. Conclusions:

The applied loads in the tests conducted on 11-21-'83 and 11-22-'83 on pier cap H 2598 did not meet criteria requirements as far as:

(a) Magnitude of total vertical load on each ledge
(b) Longitudinal horizontal forces at top of each ledge were not applied
(c) Assumed distribution of loads between outboard and inboard bearings was far more liberal than actually occurs, with significant errors in the high overload cases.
(d) 4 of outboard jacks were not correctly located, particularly for high overload cases
(e) This was a limited static load test (one or two cycles only) and yet no operational overload was applied to simulate the effects of repetitive loading over 60 years of service life.

THEREFORE, OVERALL REVIEW OF TEST PROCEDURES IS RECOMMENDED.

11-26-'83